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SYSTEM HANDBOOK

MIDAS OUTSTATION

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TABLE OF CONTENTS

1. INTRODUCTION 6
1.1 Purpose 6
1.2 Scope 6
1.3 Related Documents 6
1.3.1 Required Documents 6
1.3.2 Reference Documents 7
1.4 Abbreviations 8
1.5 Issue State 8
1.6 SAFETY WARNING 9
1.7 Operational Warning 9

2. EQUIPMENT DESCRIPTION 10
2.1 Functionality 10
2.2 System Overview 10
2.3 Physical Arrangement 14
2.4 Power System 14
2.5 Cables 15
2.6 PCBs 15
2.6.1 Power PC Processor PCB 15
2.6.2 Comms I/O PCB 15
2.6.3 Loop Detector PCB 16
2.6.4 RS485 Line Protection Module PCB 16

3. INSTALLATION 17
3.1 Physical Installation 17
3.1.1 Installation List 17
3.1.1.1 Installation Kit 17
3.1.2 Non-Standard Tools 17
3.2 Connect RS485 Line Protection Module 17
3.3 Fit Local Transponder Lead 18
3.4 Loop Detector Leads 19
3.5 Earthing 19
3.6 Address Header 20
3.6.1 Programming the Address Header 20
3.6.2 Fitting the Address Header 20
3.7 Connect Mains Lead to PDU 21

4. COMMISSIONING 22
4.1 Initial Setup 22
4.2 Using the Transponder Simulator to set the Outstation to Normal Mode 22
4.3 Configure the Loop Sensitivities 23
4.4 Final Checks 24

5. MAINTENANCE 25
5.1 Replaceable Parts 25
5.2 Routine Maintenance 25
5.3 Fault Finding 26
5.4 Reset 28
5.5 Fitting and Replacement Procedures 28
5.5.1 Default Settings 29
5.5.2 Power PC Processor PCB 30
5.5.2.1 Power PC Processor PCB Battery 30
5.5.3 Comms I/O PCB 30
5.5.4 Loop Detector PCB 30

5.5.5 Power Supply Unit 31
5.5.6 Power Supply Battery 31
5.5.7 RS485 Line Protection Module PCB 32
5.5.8 Fuses 32
5.5.8.1 Battery Fuse 32
5.5.8.2 Mains Fuse 32
5.5.8.3 Line Protection Module Fuse 32

6. USE OF THE STCL ENGINEER'S TERMINAL 33
6.1 General 33
6.2 Configure 34
6.2.1 Configure Baud Rate 35
6.2.2 Get Host Status 35
6.3 Status 35
6.3.1 Extended Status 36
6.3.2 Device Modification 38
6.3.3 Loop Status 38
6.4 Report 39
6.4.1 Fault Report 39
6.5 Logging 41
6.5.1 Logging 41
6.6 Settings 43
6.6.1 Baud Speed 44
6.7 Help 45
6.7.1 About MIDAS 45
6.8 Exit 46
6.8.1 Quit 46

7. TECHNICAL SPECIFICATION 47
7.1 Physical Characteristics 47
7.2 Power Requirements 47
7.3 Features 47
7.4 Safety 47
7.5 EMC 47
7.6 Environmental Information 47
7.7 Data Rates 48
7.8 Battery Backup 48
7.9 Lightning Protection 48
7.10 Processor 48
7.11 Engineer's Terminal 48
7.12 Loop Detectors 49

APPENDIX A - TECHNICAL DRAWINGS 50

APPENDIX B - PARTS LISTS 51

APPENDIX C - PART NUMBERS 52

APPENDIX D - INITIALISATION SIMULATOR SCRIPT 53

INDEX 55

FIGURES

FIGURE 1 - SYSTEM OVERVIEW....11
FIGURE 2 - SYSTEM SCHEMATIC DIAGRAM....12
FIGURE 3 - FRONT PANELS....13
FIGURE 4 - HARDWARE MODULE ARRANGEMENT (FRONT VIEW, FRONT PANELS REMOVED)....14
FIGURE 5 - DETECTOR BACKPLANE....19
FIGURE 6 - ADDRESS HEADER....20
FIGURE 7 - INITIAL SCREEN....33
FIGURE 8 - CONFIGURE MENU OPTIONS....34
FIGURE 9 - CONFIGURE BAUD RATE DIALOG BOX....35
FIGURE 10 - STATUS MENU OPTIONS....35
FIGURE 11 - EXTENDED STATUS DATA DIALOG BOX....36
FIGURE 12 - DEVICE MODIFICATION DIALOG BOX....38
FIGURE 13 - LOOP STATUS DIALOG BOX....38
FIGURE 14 - REPORT MENU OPTION....39
FIGURE 15 - FAULT REPORT DIALOG BOX....40
FIGURE 16 - LOGGING MENU OPTION....41
FIGURE 17 - LOGGING CONTROL DIALOG BOX....41
FIGURE 18 - LOGGING REPORT DIALOG BOX....42
FIGURE 19 - SETTINGS MENU OPTION....43
FIGURE 20 - BAUD SPEED DIALOG BOX....44
FIGURE 21 - HELP MENU OPTION....45
FIGURE 22 - ABOUT MIDAS DIALOG BOX....45
FIGURE 23 - EXIT MENU OPTION....46
FIGURE 24 - WIRING DIAGRAM FOR ENGINEER'S TERMINAL TO OUTSTATION CABLE....49

TABLES

TABLE 1 - CABLE CONNECTIONS....15
TABLE 2 - LEDS....15
TABLE 3 - RS485 LINE PROTECTION CONNECTIONS....18
TABLE 4 - WIRING OF LOOP LEADS....19
TABLE 5 - ADDRESS LINK VALUES....20
TABLE 6 - DETECTOR SENSITIVITY SETTINGS....23
TABLE 7 - DETECTOR OPERATING FREQUENCY SETTINGS....23
TABLE 8 - FAULT FINDING....27
TABLE 9 - FUSE RATINGS....32
TABLE 10 - EXTENDED STATUS DATA DETAILS....37
TABLE 11 - DEVICE MODIFICATION DETAILS....38
TABLE 12 - FAULT REPORT DETAILS....40
TABLE 13 - ALERT LOGGING REPORT DETAILS....42
TABLE 14 - VEHICLE DATA LOGGING REPORT DETAILS....43

1. INTRODUCTION

1.1 Purpose

This Handbook contains the information needed to install and maintain the STCL MIDAS Outstation. In the interests of Health and Safety, when installing, using or servicing the equipment, the instructions in Section 1.6 should always be followed.

1.2 Scope

This document covers the general description and installation, commissioning and maintenance instructions for the MIDAS Outstation. The Outstation configuration will determine which sections of the Handbook are relevant.

1.3 Related Documents

1.3.1 Required Documents

The documents in the following table are referred to in the text of this Handbook, and **are required** when installing, commissioning and maintaining MIDAS equipment.

STCL Document	667/HB/26766/ETC	MIDAS Transponder System Handbook
Highways Agency Drawings	MCX 0156 Sheets 1 and 2 MCX 0834 Sheets 1 – 4 MCX 0594 Sheets 1 – 4	NMCS Installation Cabinet 600 600 Cabinet Equipment Configuration NMCS2 Midas 600 Cabinet Arrangement

1.3.2 Reference Documents

The documents in the following table are referred to in the text of the Handbook, but are not required when installing, commissioning and maintaining MIDAS equipment.

Highways Agency	TR 0100A (Nov 1993)	Inductive Loop Vehicle Detection Equipment
	TRG 1068 (Feb. 1991)	Electromagnetic Compatibility Tests for Motorway Communications Equipment and Portable and Permanent Traffic Control Equipment
	MCG 1089I9 (June 2007)	NMCS2 MIDAS Outstation Acceptance Test Specification
	TR 1100A (Feb 1991)	Technical and Quality Control Requirements for Systems, including parts of Systems, Manufactured, Supplied, Installed or Maintained
	TR 2066C (Aug 1993)	HDLC Multi-Drop Communications Electrical and Protocol
	TR 2130B (May 1993)	Environmental Tests for Motorway Communications Equipment and Portable and Permanent Traffic Control Equipment
	TR 2142A (July 1993)	Message Control Message Sign Equipment
	TR 2146E (April 2005)	MIDAS Outstation Link Specification
	TR 2169J4 (July 2006)	MIDAS Outstation Specification
	TR 2172B (Sept 1994)	MIDAS Engineer's Terminal Link Specification
	TR 2173J (April 2005)	MIDAS Message Specification
	TR 2177F (Nov 1999)	MIDAS Outstation Algorithm Specification
CCITT	K20	Lightning protection
DTI	MPT 1337	Performance Specification for Low Power Induction Communications and Control Systems
British Standards	BS6328 Part 1	Apparatus for connection to Private Circuits
	BS EN 41003:1993	Particular Safety Requirements for Equipment to be Connected to Telecommunication Networks
	BS EN 60950:1992	Safety of Information Technology Equipment, Including Electrical Business Equipment
	BS7671	IEE Wiring Regulations
		Control of Substances Hazardous to Health Regulations 1988

1.4 Abbreviations

COBS	Control Office Base System
CRC	Cyclic Redundancy Check
EMC	Electro Magnetic Compatibility
HDLC	Higher level Data Link Control
IDC	Insulation Displacement Connector
LCC	Local Communications Controller
MIDAS	Motorway Incident Detection and Automatic Signalling
MIU	MIDAS Interface Unit
NMCS2	National Motorway Communications System Mk 2
O/S	Outstation
PC	Personal Computer
PCB	Printed Circuit Board
PDU	Power Distribution Unit
PPC	Power PC
PSU	Power Supply Unit
STCL	Siemens Traffic Controls Limited
TPR	Transponder

1.5 Issue State

Pages	Current Issue	Change Ref.	Type	Part ID
1 to 56	3	TS000363	AMW	667/HB/26767/ETC
1 to 56	4	TS002150	Meridian	667/HB/26767/ETC
1 to 56	5	TS002162	Meridian	667/HB/26767/ETC
1 to 56	7	TS004652	Meridian	667/HB/26767/ETC

1.6 SAFETY WARNING

In the interests of Health and Safety, when installing, using or servicing this equipment the following instructions must be noted and adhered to:

i) Only skilled or instructed personnel with relevant technical knowledge and experience, who are also familiar with the safety procedures required when dealing with modern electrical and electronic equipment are to be allowed to use and/or work on the equipment.

ii) Such personnel must take heed of all relevant notes, cautions and warnings in this Handbook and any other document or Handbook associated with the MIDAS Outstation including, but not restricted to the following:

   a) The equipment must be correctly connected to the specified incoming power supply.
   b) The equipment must be disconnected/isolated from any incoming power supply before removing any protective covers, or working on any part from which protective covers have been removed.
   c) All wiring must be carried out in accordance with the requirements of BS7671 (IEE Wiring Regulations).
   d) MIDAS Outstations use Sealed Lead Acid Batteries. Care must be taken in handling these to prevent a short circuit condition occurring on any of the Lead Acid Cells. The Power PC Processor PCB contains a Nickel Metal Hydride Battery, which does not require special handling as it contains no mercury, cadmium or lead.
   e) Exercise great care when handling old batteries, which may be leaking. BATTERIES MUST BE DISPOSED OF IN ACCORDANCE WITH THE "CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH REGULATIONS 1988". SPENT BATTERIES MUST BE DISPOSED THROUGH AN APPROVED HAZARDOUS WASTE DISPOSAL CONTRACTOR. **DO NOT** PUNCTURE BATTERIES. **DO NOT** DISPOSE OF BATTERIES IN ANY FIRE.

1.7 Operational Warning

Do not carry out a manual reset during a mains fail, as the equipment will shut down.

2. EQUIPMENT DESCRIPTION

2.1 Functionality

MIDAS Outstations are physically located adjacent to motorways that have been equipped with inductive loops. Loop pairs are normally sited at 500m intervals along the carriageway. One pair of loops is fitted in each running lane and in the hard shoulder. Up to 10 pairs of loops can be controlled and monitored by loop detectors within the Outstation.

Each MIDAS Outstation continuously monitors vehicle data on a per lane basis. Vehicle counts, speed, headway and length data for individual vehicles are calculated. Time-averaged statistical data is reported to the Instation via the Transponder and LCC as Traffic Data. Raw data is used by algorithms which report corresponding MIDAS Alerts to the Instation.

The MIDAS System Overview in Figure 1 shows how the Transponder and Outstation interface to one another, and to other traffic control equipment.

A serial interface allows connection of a MIDAS Engineer's Terminal, which can give identity, version and status information. Individual Vehicle Data and MIDAS Alerts are also available on this link.

An additional auxiliary link is also provided. It operates in an output only mode and transmits Individual Vehicle Data, Traffic Data and MIDAS Alerts in response to Instation configurable parameters.

Further details of MIDAS Outstation functionality may be obtained from the MIDAS Outstation Specification, document reference TR 2169J4 .

2.2 System Overview

The MIDAS Outstation consists of the following items, as shown in the Schematic Diagram, Figure 2

1 x Power PC Processor PCB

1 x Comms I/O PCB

1 x RS485 Line Protection Module PCB

5 x Loop detector PCBs

1 x Detector Backplane

1 x Power Supply Unit

1 x Battery backup

There is also an Address Header, not shown on Figure 2, which connects to the front of the Comms I/O PCB and is described in Section 3.6.

The communications link between the Transponder and Outstation is RS485.

The auxiliary link is an extra RS485 communications link, the use of which is optional.

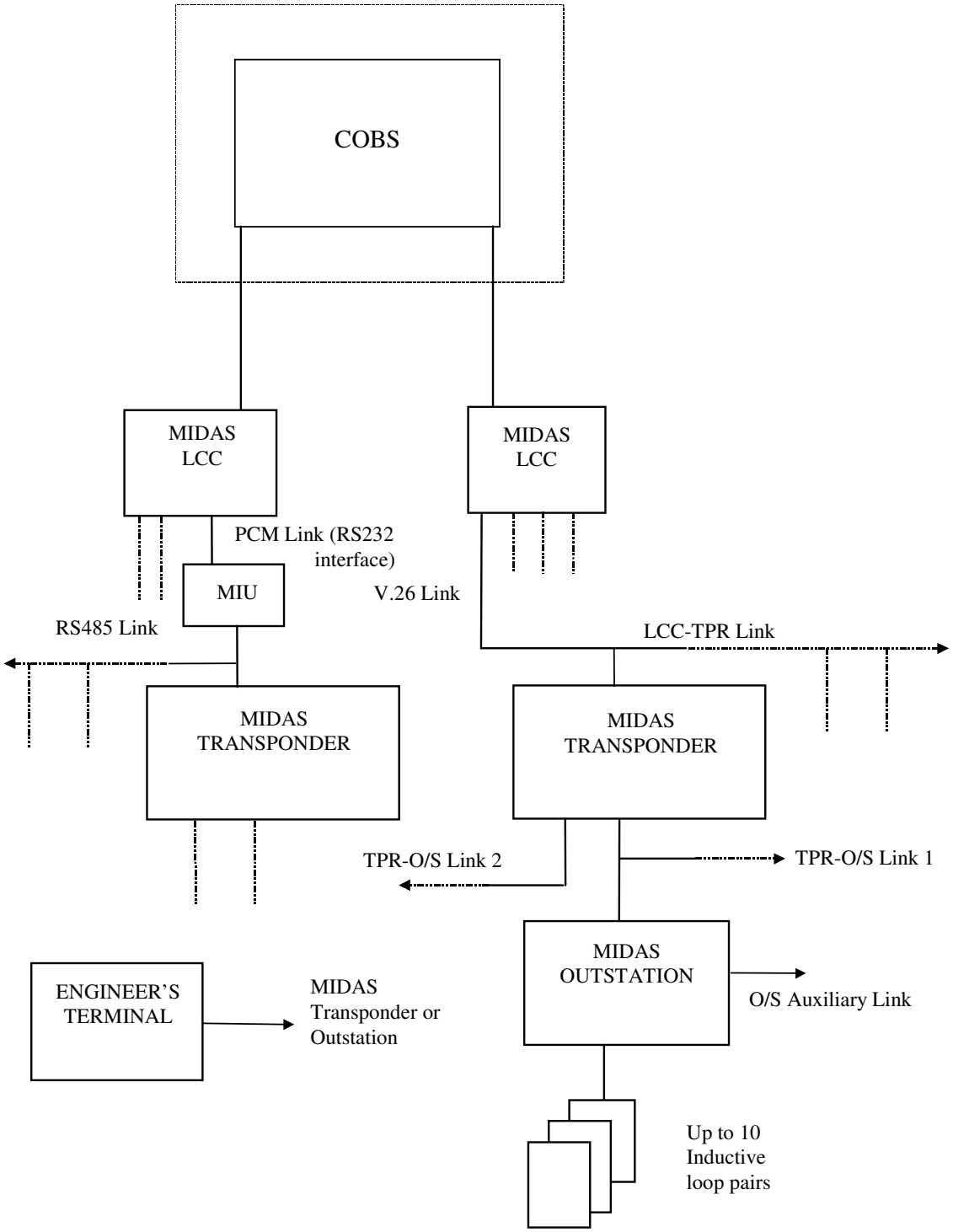


Figure 1 - System Overview

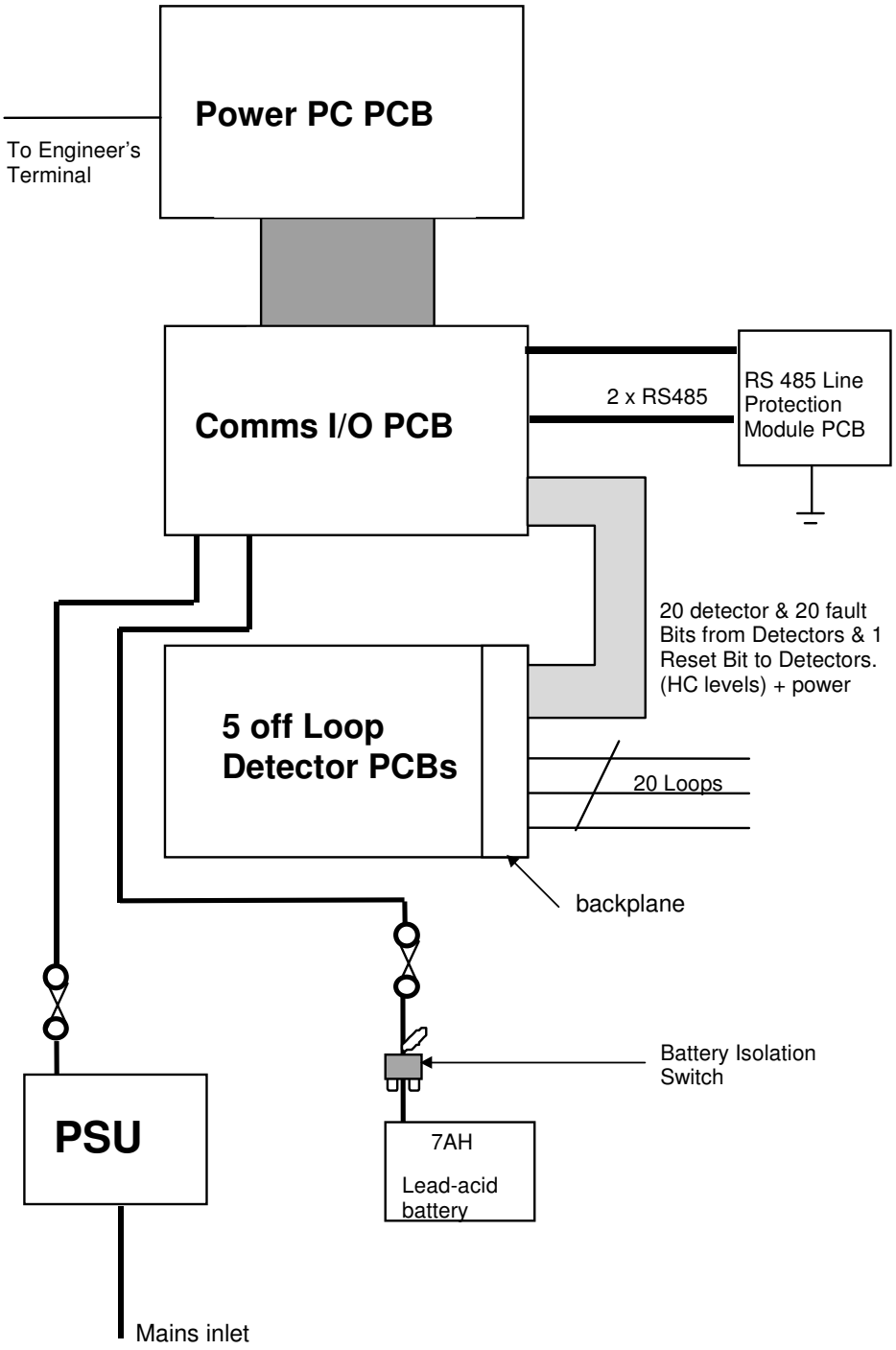


Figure 2 - System Schematic Diagram

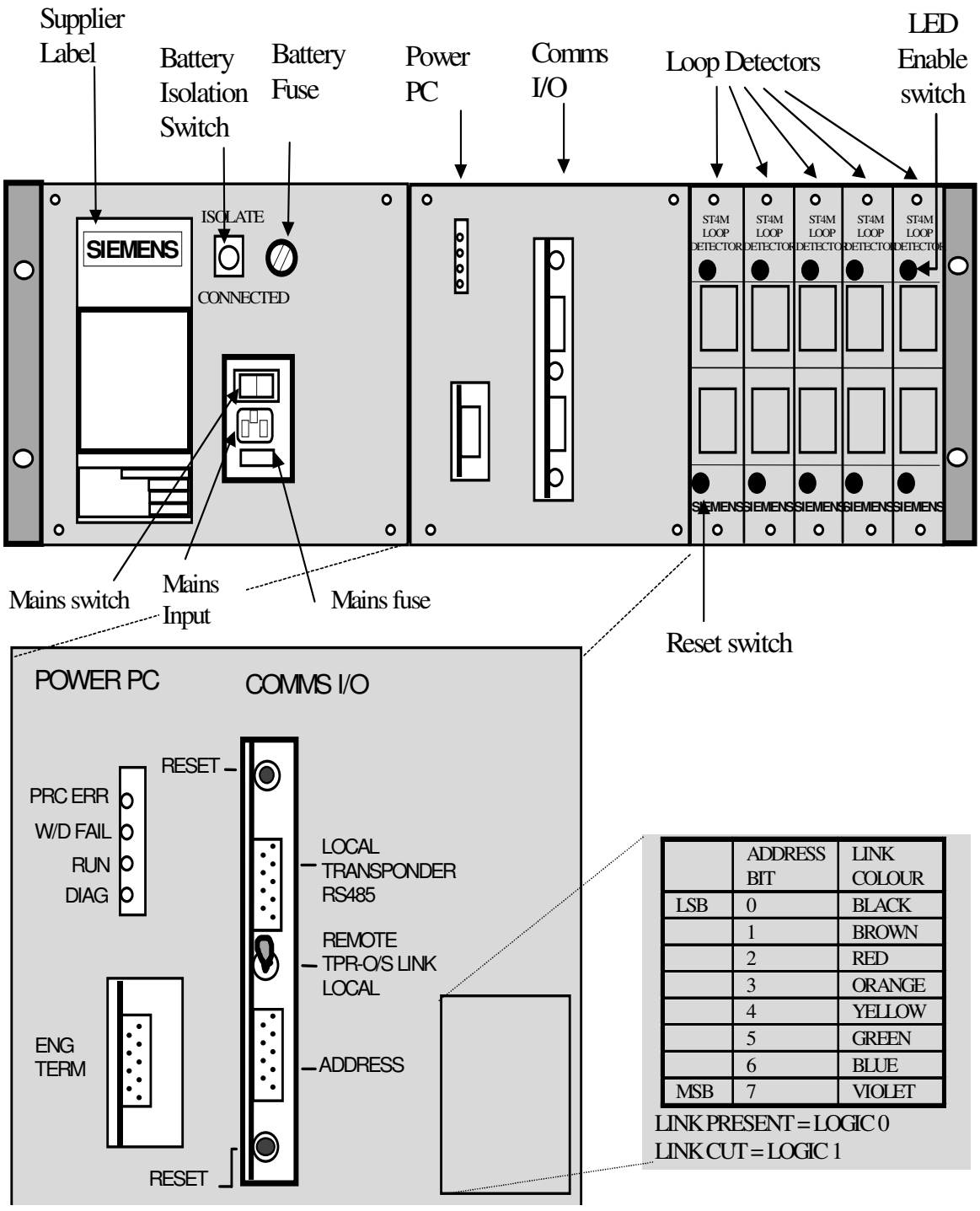


Figure 3 - Front Panels

2.3 Physical Arrangement

The MIDAS Outstation is mounted in a standard 19" equipment rack of 3U height, which provides a mounting frame and mechanical protection for all the hardware.

All RS485 inputs to the MIDAS equipment are routed through the Line Protection Module mounted at the rear of the cabinet.

The Outstation may be housed within the same cabinet as the Transponder, in which case the RS485 connection may be made to a socket on the front of the Comms I/O PCB. For more information, see Section 3.3.

A view of the equipment with the front panel removed is shown in Figure 4.

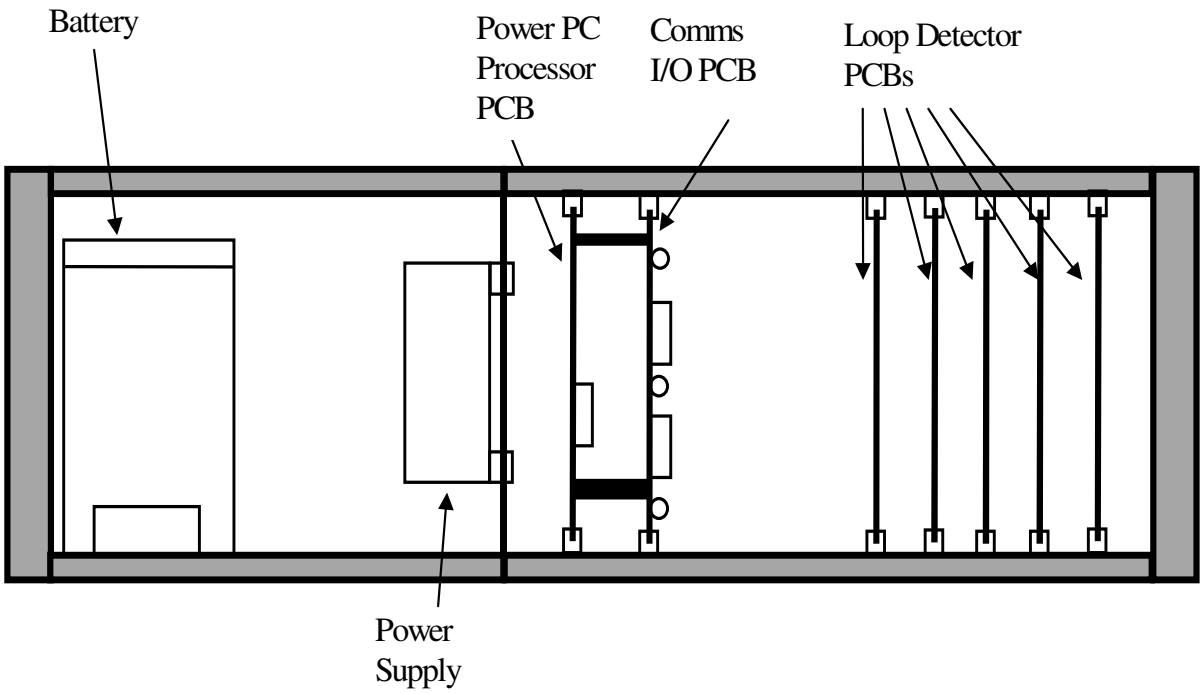


Figure 4 - Hardware Module Arrangement (front view, front panels removed)

2.4 Power System

The power supply is a 30W switched mode unit with a single voltage output. It is used to power the MIDAS Outstation hardware and charge the battery backup unit. See Section 7.2 for details of the power requirements.

The battery is a 12V sealed lead-acid type. It is capable of providing up to 20 hours cover in the event of a mains failure.

The system operates normally while the battery is being recharged. The battery is fully recharged within 5 hours of mains power restoration.

2.5 Cables

The cables are connected as follows:

Cable	Connection
Mains	Via IEC320 connector on the front panel. See Section 3.7.
RS485	Via Klippon block. See Section 3.2.
Earths	Refer to Section 3.5.
Loops	Refer to Section 3.4.

Table 1 - Cable Connections

The Klippon block positions are defined in Highways Agency drawing MCX 0594 .

2.6 PCBs

2.6.1 Power PC Processor PCB

The Power PC Processor PCB is based on an IBM 403GA PowerPC, which is a 32-bit Processor.

The PCB has two serial ports. One is a 9 pin 'D' type socket located on the front, into which a MIDAS Engineer's Terminal can be connected. The other, an 18 pin IDC connector, is located at the back and is not used.

There are 4 LEDs located on the front which indicate the following:

LED	Function	No Fault State	Fault Indicated State
PRC ERR	Processor Error	Off	Lit Red
W/D FAIL	Watchdog Failure	Off	Lit Red
RUN	Software running	Flashing Green	Off/Steady Green
DIAG	Software status indication	Off	Lit Green

Table 2 - LEDs

See Table 8 Section 5.3 for details of the diagnosis and possible remedy when a fault is indicated by one of the LEDs.

2.6.2 Comms I/O PCB

The Comms I/O PCB main functions are to provide interfaces to the battery charger and battery monitor circuits and the RS485 communications channels.

At the front of the PCB (top and bottom) are two reset switches, which when pressed at the same time cause a system reset.

The Board Address Header is a 9 pin 'D' type socket above the lower reset switch. A 9 pin 'D' type plug which has the address of the Outstation configured is plugged into this socket. See Section 3.6.

There is also a logic level interface via a 50 way connector to the detector PCBs.

2.6.3 Loop Detector PCB

The Loop Detector detects the presence of vehicles over inductive loops. Each Loop Detector can support up to 4 loops.

The operating frequency and sensitivity of each of the loops is adjusted independently using on-board switches.

2.6.4 RS485 Line Protection Module PCB

This PCB provides the Outstation with lightning protection, and connects to the rear of the cabinet.

3. INSTALLATION

3.1 Physical Installation

The Outstation is supplied fully assembled with the exception of the Address Header and the mains power cable. All the parts needed for an installation are contained within the packaging. Locate the Installation kit of parts which contains all the fixings required to install the unit and check it against Section 3.1.1.1. No specialised tools are required other than those listed in Section 3.1.2.

Insert the cage nuts into the required positions in the front of the Type 600 frame and mount the Outstation using four screws and washers at the front. The location of the unit within the Type 600 frame is detailed in the Highways Agency installation drawings.

3.1.1 Installation List

- Outstation Assembly
- Outstation Installation Kit (See Section 3.1.1.1 below).

3.1.1.1 Installation Kit

The following items are provided in a plastic bag tie-wrapped to the rack:

4 x Cage nuts

4 x Machine screws

4 x Washers

1 x Address Plug (uncoded)

1 x Mains Power Cable.

2 x 300 ohm Resistors *

* These are not required where line termination is already provided as part of the cable installation; typically the RS485 lines are already terminated with a 140 ohm resistor at each end.

3.1.2 Non-Standard Tools

The only items needed to complete an installation are a normal set of Engineer's tools and the following:

- Indelible pen for marking the address on the Address Header.

3.2 Connect RS485 Line Protection Module

Connect the module in accordance with Table 3 overleaf. It is advisable to fit the RS485 Line Protection Module to the Klippon block before terminating its earth lead (See Section 3.5). This ensures that the earth lead is long enough to reach the appropriate earthing point in the cabinet.

Refer to the Highways Agency installation requirements for specific fitting instructions. See also the Highways Agency drawing MCX 0834 sheets 1 and 4 for more details.

Terminal Block Position	Link Function	RS485 Polarity
1	Transponder - Outstation Link	A
2	Transponder - Outstation Link	B
3	Outstation Auxiliary Link	A
4	Outstation Auxiliary Link	B
5 - 12	Not used	-

Table 3 - RS485 Line Protection Connections

3.3 Fit Local Transponder Lead

This section only applies if the Outstation is in the same cabinet as the MIDAS Transponder, and there are no other outstations connected to that Transponder link. Also a special cable is required (not available from STCL at time of publication).

In this case the Outstation may be connected via the 'D' type plug on the front of the Outstation Comms I/O PCB instead of via the rear connector and R485 line protection board via the special cable.

It is important to check that the Transponder connection is not shared with any outgoing line as no lightning protection is provided on the 'D' type connection.

The switch, marked TPR - O/S LINK, on the front of the board routes the RS485 port either to this front panel 'D' type (Local) or to the rear RS485 connector (Remote).

If a local lead is connected, select the 'LOCAL' position with the front panel switch. Otherwise select the 'REMOTE' position.

If no lead is available then mount the RS485 protection connection board as usual and wire to the Transponder Protection board in parallel with the with the external Transponder line connections.

3.4 Loop Detector Leads

The loop connection leads are supplied as a single cableform with 3 off Berg headers on the 'outstation' end and 4 off Klippon block at the 'loop feeder' end. Note that the Klippon blocks are not identical - they are 'handed', i.e. the blocks for the left hand side of the cabinet are numbered form the opposite end to those on the right.

Connect the pairs of loop leads according to the following table:

Loop No.	Colour of loop pair	Detector Backplane connector
1	Brown / Blue	**PL2**
2	Brown / Violet	
3	Brown / Slate	
4	Brown / White	
5	Red / Blue	
6	Red / Violet	
7	Red / Slate	
8	Red / White	
9	Orange / Blue	**PL3**
10	Orange / Violet	
11	Orange / Slate	
12	Orange / White	
13	Yellow / Blue	
14	Yellow / Violet	
15	Yellow / Slate	
16	Yellow / White	
17	Green / Blue	**PL4**
18	Green / Violet	
19	Green / Slate	
20	Green / White	

Table 4 - Wiring of Loop Leads

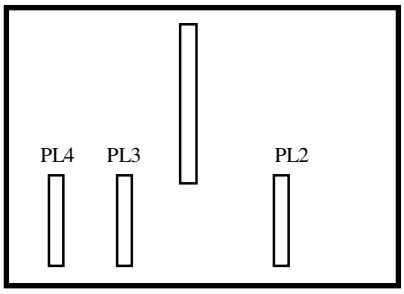


Figure 5 - Detector Backplane

The wires are terminated with plug-in Klippon blocks which should be connected to the rear of the type 600 cabinet to TBA9 & 10 and TBG9 & 10 as shown on H.A. drawing MCX0834 sheet 1.

3.5 Earthing

The Outstation has a flying earth lead which is attached to the front panel star point. There is also a flying earth lead on the RS485 Line Protection module. These flying earth leads must be fed down the side of the T600 cabinet, and terminated on the cabinet earth point.

3.6 Address Header

This sets the address of the unit in binary.

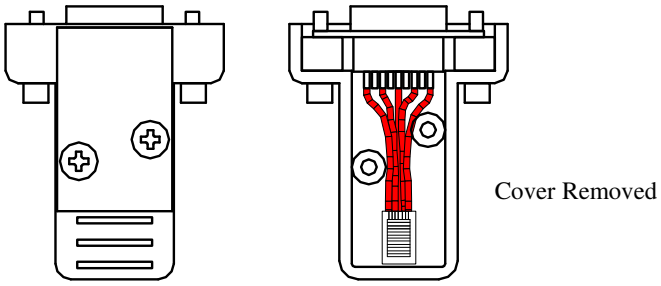


Figure 6 - Address Header

3.6.1 Programming the Address Header

Dismantle the unit by removing the two front cover screws, and cut the links where appropriate. Table 5 below gives details of the link values.

	Address Bit	Link Colour
LSB	0	Black
	1	Brown
	2	Red
	3	Orange
	4	Yellow
	5	Green
	6	Blue
MSB	7	Violet

Link Present = Logic 0
Link Cut = Logic 1

Table 5 - Address Link Values

For example: To set Address 5 hex (00000101 bin), cut the Black and Red links.

To set Address 55 hex (01010101 bin), cut the Black, Red, Yellow and Blue links.

To set Address 42 hex (01000010 bin), cut the Brown and Blue links.

To set Address 97 hex (10010111 bin), cut the Black, Brown, Red, Yellow and Violet links.

Write the address on the white label in indelible pen.

3.6.2 Fitting the Address Header

Reassemble and fit the address header into the front connector of the Comms I/O PCB (See Figure 3). Screw it securely to the PCB.

3.7 Connect Mains Lead to PDU

Ensure the mains power to the cabinet is turned off before starting to connect the power lead.

Connect the mains lead in accordance with Highways Agency drawings MCX 0156 sheets 1 and 2. The PDU is located in the base of the equipment cabinet.

4. COMMISSIONING

Commissioning may be performed either with connection to the instation via a Transponder or by use of a suitable simulator. The simulator must provide an RS485 connection and is connected to the Outstation in place of the normal line connection, i.e. at the Klippon block on the line protection board. If a simulator is used, a suitable address plug must be used to match the Outstation address that the simulator is using.

4.1 Initial Setup

- Ensure that the switch and link settings on the unit are set to their default values, as defined in section 5.5.1.
- Turn the power on at the main switch.
- Make sure that the Battery Isolation Switch is set to Connected.
- Set the TPR-O/S link switch on the comms I/O card to LOCAL or REMOTE as appropriate (see Section 3.3).
- Check the Power PC LEDs. (The RUN LED should be flashing green, the others should be off.)
- Connect an Engineer's Terminal (Section 7.11 defines the hardware and software requirements for the Engineer's Terminal) and continue as follows:
- Check that the baud rates are as described in Section 6.6.1 (factory defaults).
- Check at the Control Office or Instation that communications have been established. Communications are established when the Outstation receives site data from the Instation. If the instation is not ready for communications go to section 4.2. Otherwise skip section 4.2.
- Check the Extended Status Data dialog box. The details should be as seen in Figure 11 except the entry against Config Data CRC, which is not material here. "Transponder Link" should show OK, to indicate that the Outstation is communicating with the Transponder. "Loop Status" should be showing 0. If "Battery" shows low, commissioning may continue. It may be necessary to wait at least for one hour for the battery to become sufficiently charged, when the fault should clear.

4.2 Using the Transponder Simulator to set the Outstation to Normal Mode

Refer to Appendix D for Simulator script details.

- Connect the RS485 link from the Golden River MIDAS Transponder Simulator to the Outstation either by wiring to the LOCAL TRANSPONDER D-type on the front or to the RS485 connection on the line protection board. Set the TPR-O/S link switch on the comms I/O card accordingly.
- Fit the test address plug (address = 05) into the socket labelled ADDRESS on the comms I/O card and reset the Outstation by pressing both reset buttons.
- Make sure that the Battery Isolation Switch is set to CONNECTED.
- Run the MIDEQUIP Transponder Simulator with the script OSINI.SCR to set the Outstation to Normal mode. Ensure that the terminal screen shows 1 pass 0 failures. Record the result.

4.3 Configure the Loop Sensitivities

- When the traffic flow is dense it may be necessary to switch off all but the pair of channels to be tested by using the sensitivity switches on the loop cards (See Table 6 below). If the channels are switched off during testing, they must be re-enabled to the correct sensitivity when steps 1 & 2 below are completed.
- The RESET button on the detector card must be pressed if the switch settings are changed. Changes in the settings will not take effect until the card is reset.
- **Step 1:** Enable the logging vehicle data message as described in section 6.5.1. Go to the Logging Report Dialog Box (Figure 18). Check that a vehicle passing a pair of loops in a lane causes the detect LEDs of the corresponding loop detector channels to flash and a vehicle data message appears on the screen of the engineers terminal. Record the result.
- **Step 2:** While monitoring the flow of vehicles in a lane, look for the passage of a vehicle with a known length. Compare the length of this vehicle with the vehicle record. If the vehicle record length is too short, the sensitivity of the pair of loop detector channels should be increased. Conversely, if the length is too great, the sensitivity should be reduced.
- The sensitivity of both loops should be adjusted together.
- Repeat this procedure until the outstation consistently gives the correct length for a known set of vehicles and record the sensitivity.
- Repeat steps 1 and 2 for each pair of detector channels
- **Step 3:** Once all detectors are set and enabled, check each channel for spurious loop events or cross-channel interference i.e. any detection of a vehicle not in the same lane as the loop. If spurious loop events occur, select a different detector operating frequency (see Table 7). Alternatively, reduce the sensitivity of the loop detector channel concerned then repeat step 2 for the channel. Record any changes to the sensitivity against step 3.

S1	S2	S4	Sensitivity (%ΔL/L)
ON	ON	ON	Channel Off
OFF	ON	ON	0.02
ON	OFF	ON	0.04
OFF	OFF	ON	0.08
ON	ON	OFF	0.20
OFF	ON	OFF	0.50
ON	OFF	OFF	0.50
OFF	OFF	OFF	1.00

Table 6 - Detector Sensitivity Settings

SW 5 – 8, Pos 1	SW 5 – 8, Pos 2	Frequency
OFF	OFF	Highest
ON	ON	Lowest
OFF	OFF	Highest
ON	ON	Lowest

Table 7 - Detector Operating Frequency Settings

4.4 Final Checks

- If the Outstation is working correctly, no faults will appear in the Fault Report.
- Check the Outstation address is correct for the location.
- Make sure the TPR-O/S link switch is set to REMOTE unless a local lead is fitted - see Section 3.3.

Note: A telephone and fax “Help Line” facility is available. See page 2 at the front of this handbook for details.

5. MAINTENANCE

Before undertaking any maintenance of the equipment, read the Safety Instructions in Section 1.6.

When maintenance and refitting is carried out on other equipment within the cabinet, it may be necessary to move MIDAS equipment, in particular the RS485 Line Protection Module. Follow the instructions given for individual items of equipment in Section 5.5.

For a diagram of the Outstation internal layout see Figure 4, and for the front panels see Figure 3.

In addition to standard equipment such as tools for dismantling and wiring, an Engineer's Terminal is required - see Section 7.11.

5.1 Replaceable Parts

The following parts are replaceable. Follow the instructions given in the remainder of the section for replacing individual parts.

Address Header
Battery Backup fuse
Comms I/O PCB
Line Protection Module fuse
Loop Detector PCB
Mains fuse
Outstation Power PC Processor PCB
Outstation PROM
Power PC Processor PCB Battery
Power Supply Battery
Power Supply Unit
RS485 Line Protection Module PCB

Appendix C gives the part numbers.

5.2 Routine Maintenance

The only routine maintenance required is the replacement of batteries. There are two types of battery in each Outstation. Before removing or replacing batteries, read the Safety Warning in Section 1.6.

One is the power supply battery backup, which is a 12V sealed lead-acid type, with an estimated minimum life of 5 years. Instructions for replacing the power supply battery can be found in Section 5.5.6.

The other is the RAM battery backup. This is a 3V nickel metal hydride type contained within the Power PC Processor PCB which has an estimated minimum life of six years. Follow the instructions in Section 5.5.2.1 to replace the battery.

To minimise site visits, it is recommended that both batteries be replaced at the same time. A replacement schedule should be prepared which ensures that each battery is replaced no later than five years from the date of delivery.

5.3 Fault Finding

Listed below are the main faults that might be reported by Outstations. If any fault is reported which is not listed below, or a fault persists after trying the remedy(ies) suggested, consult STCL (see page 2 for details).

Symptom	Diagnosis	Remedy
The PRC ERR LED on the Power PC PCB is lit	Processor error.	Replace the PPC PCB. Consult STCL (see page 2)
	Software exception error.	Replace the PPC PCB. Consult STCL (see page 2)
The W/D FAIL LED on the Power PC PCB is lit	The watchdog has failed.	Reset the Outstation. (**DO NOT** reset if the mains has failed. See Section 5.4). Check the watchdog link is shorted (LK5 on PPC PCB).
	Hardware fault.	Reset the Outstation. (**DO NOT** reset if the mains has failed. See Section 5.4). If the fault persists, replace the PPC.
The RUN LED on the Power PC PCB is not flashing	Software is not running.	Reset the Outstation. (**DO NOT** reset if the mains has failed. See Section 5.4). If the fault persists, replace the PPC.
	Hardware fault.	Reset the Outstation. (**DO NOT** reset if the mains has failed. See Section 5.4). If the fault persists, replace the PPC.
The DIAG LED on the Power PC PCB is lit	There is a fault reported in the Fault Log.	Refer to the Fault Report for further information. See Section 6.4.1.
A Battery Low fault is reported at the Instation or in the Fault Report. (To access the Fault Report via the Engineer's Terminal see Section 6.)	The battery is not charging.	Check the Battery Isolation Switch is set to connected. Replace the battery.
	The battery is disconnected.	Check the battery connections. Check the Battery Isolation Switch is set to connected. Check the battery fuse.
	The Comms I/O has failed.	Replace the Comms I/O module.

Symptom	Diagnosis	Remedy
A Mains Fail fault is reported at the Instation or in the Fault Report. (To access the Fault Report via the Engineer's Terminal see Section 6.)	The Mains is disconnected.	Check that the mains is connected.
	The Mains has failed.	Check the mains fuse. Check the mains supply. **DO NOT** reset the Outstation. See Section 5.4.
	The PSU has failed.	The PSU output should be 15V ±1V. If not, replace the PSU.
	The Comms I/O has failed.	Replace the Comms I/O module.
A Battery Charger fault is reported at the Instation or in the Fault Report. (To access the Fault Report via the Engineer's Terminal see Section 6.)	The Battery is not charging.	Check the battery leads. Check the battery fuse. Change the battery.
	The Battery is disconnected.	Check the battery connections. Check the Battery Isolation Switch is set to connected. Check the battery fuse.
	The Comms I/O has failed.	Replace the Comms I/O module.
A Loop Detector fault is reported at the Instation or in the Fault Report. (To access the Fault Report via the Engineer's Terminal see Section 6.)	A road loop is disconnected.	Reconnect the road loop. Reset the detector.
	A road loop is shorted	Remove the short. Reset the detector.
	A fault in the Loop Detector Board.	Replace the Loop Detector Board.
Instation reports Outstation unobtainable	The Transponder link has failed.	Check the Transponder link connections. Check the site configuration.
	The address is configured incorrectly	Reconfigure the address header
	The Transponder has failed	See the Transponder System Handbook, document reference 667/HB/26766/ETC.
Any other fault report or message.		Reset the Outstation (**DO NOT** reset if the mains has failed. See Section 5.4). If the fault persists, consult STCL Engineering.

Table 8 - Fault Finding

5.4 Reset

Note: **Do Not** carry out a manual reset during a mains fail, as the equipment will shut down. It can only be restarted with mains present.

To carry out a reset of the Outstation, locate the two buttons marked “Reset” on the front of the Comms I/O PCB (as shown in Figure 3) and press them both at the same time. The system then restarts.

Note: Loop Detectors at the Outstation also have reset buttons, which are required for resetting latched loop faults and for changing loop sensitivity and presence times.

5.5 Fitting and Replacement Procedures

Please note that PCB switches are factory set. Check with Section 5.5.1 that the PCB is the correct one and that the default settings are correct before fitting the replacement. Part numbers for all the replaceable parts are given in Appendix C.

5.5.1 Default Settings

The following table shows the default settings for the various items of equipment.

It is important to ensure that the equipment uses the settings detailed below when installed.

	Default Setting	Meaning
Power PC Processor PCB		
Battery switch	On	Battery Connected
Watchdog Disable LK5	Shorted	Watchdog Enabled
All other links	Open	-
Comms I/O PCB		
PCB Add S6,1	On	One PCB in rack
2	Off	(Would be on if 2 PCBs in rack, all others off)
3	Off	(Would be on if 3 PCBs in rack, all others off)
4	Off	Not used
RS 485 Line Voltage Biasing S2	Off (Up)	Biasing Disabled
S4	Off (Up)	Disabled
S5	Off (Up)	Disabled
S8	Off (Down)	Disabled
Loop Detector PCBs		
Front panel switches S1, S2, S4 & P	All off	Presence time and loop sensitivity see sect. 4.3
Card 1 Frequency selection switches SW5 - 8	Pos 1 - Off Pos 2 - Off	Highest frequency
Card 2 Frequency selection switches SW5 - 8	Pos 1 - Off Pos 2 - On	High frequency
Card 3 Frequency selection switches SW5 - 8	Pos 1 - On Pos 2 - Off	Low frequency
Card 4 Frequency selection switches SW5 - 8	Pos 1 - On Pos 2 - On	Lowest frequency
Card 5 Frequency selection switches SW5 - 8	Pos 1 - Off Pos 2 - Off	Highest frequency
Link Data Rates (Set via Engineer's Terminal; See Section 6.6.1)		
Outstation Auxiliary Link - OAL	4800	Baud speed
Engineering Terminal Link - ETR	9600	Baud speed
Transponder Link - Upstream	4800	Baud speed
Downstream 1	Any	Not used
Downstream 2	Any	Not used

5.5.2 Power PC Processor PCB

1. The PCB contains a nickel metal hydride rechargeable battery. Note the Safety Warning in Section 1.6.
2. Switch off at the main power switch. See Figure 3.
3. Switch the battery off at the Battery Isolation Switch.
4. Undo the four screws holding the front panel and remove it.
5. Disconnect the 4 way Molex connector on the Comms I/O PCB. The PCB positions are identified on Figure 4.
6. Disconnect the 10 way IDC connector on the rear of the Comms I/O PCB.
7. Pull out the Power PC Processor PCB (PPC) and Comms I/O modules.
8. Disconnect the 50 way IDC on the Comms I/O PCB.
9. Disconnect the PPC from the Comms I/O PCB by undoing the 4 spacer screws.
10. Pull the PPC and Comms I/O units apart.
11. Replace the PPC Board. Before fitting the new board check that the default settings correspond with those in Section 5.5.1. Also make sure that the PROM part number is the same as that listed in Appendix C.
12. Reverse the above procedures to reassemble and reconnect the PCBs.

5.5.2.1 Power PC Processor PCB Battery

1. To replace the battery, follow items 1 - 10 from Section 5.5.2 above.
2. Desolder the battery (labelled BAT1) from the PCB.
3. Replace the battery and solder securely to the PCB.
4. Fix a new date label on the battery.
5. Reassemble and reconnect the PCBs.

5.5.3 Comms I/O PCB

1. Switch off at the main power switch. See Figure 3.
2. Switch the battery off at the Battery Isolation Switch.
3. Undo the four screws holding the front panel and remove it.
4. Disconnect the 4 way DC power cable connector on the Comms I/O PCB. The PCB positions are identified on Figure 4.
5. Disconnect the 10 way IDC connector on the rear of the Comms I/O PCB.
6. Pull out the Power PC Processor PCB (PPC) and Comms I/O modules.
7. Disconnect the 50 way IDC on the Comms I/O PCB.
8. Disconnect the PPC from the Comms I/O PCB by undoing the four spacer screws.
9. Pull the PPC and Comms I/O units apart.
10. Replace the Comms I/O Board. Before fitting the new board check that the default settings correspond with those in Section 5.5.1.
11. Reverse the above procedures to reassemble and reconnect the PCBs.

5.5.4 Loop Detector PCB

1. Disconnect the mains and isolate the battery using the Battery Isolation Switch on the front panel (See Figure 3).

2. Undo the two screws on the front panel holding the Detector and remove it.
3. Set all the switches on the new card to the same positions as the old card.
4. Fit the new Detector and screw to the equipment rack.
5. Restore mains power and reconnect the battery.

5.5.5 Power Supply Unit

1. Disconnect the mains and isolate the battery using the Battery Isolation Switch on the front panel (See Figure 3).
2. Remove the left-hand front panel (with the Supplier label).
3. Disconnect the DC output and mains input plugs.
4. Remove the earth lead from the screw on top of the PSU board.
5. Remove the screws holding the PSU.
6. Remove the PSU.
7. Fit the new PSU.
8. Reconnect the mains earth lead to the screw on top of the PSU board.
9. Re-connect the input and output plugs.
10. Re-fit the front panel.
11. Connect the battery using the Battery Isolation Switch, and re-connect the mains.

5.5.6 Power Supply Battery

1. Disconnect the mains and isolate the battery using the Battery Isolation Switch on the front panel (See Figure 3).
2. Remove the left hand front panel (with the Supplier label).
3. Slide out the battery and disconnect the battery terminals.
4. Replace the battery.
5. Re-connect the terminals to the replacement battery.
6. Replace the front panel.
7. Switch on the battery at the Battery Isolation Switch on the front panel.
8. Re-connect the mains.
9. Handle and dispose of the battery safely in accordance with the Safety Warning in Section 1.6.

5.5.7 RS485 Line Protection Module PCB

This module protects the equipment against induced voltage transient and excessive line voltages/currents. The fuses will blow if excessive currents are coupled into the lines. It is unlikely that the module will require replacement, but it may need to be moved within the cabinet when rewiring is carried out or new equipment is fitted.

Proceed as follows:

1. Remove the cabling.
2. Unscrew the module from the cabinet rear cage ribs and remove.
3. Fit the new module by screwing to the cabinet rear cage ribs.
4. Refit the cabling.

5.5.8 Fuses

Location	Fuse	Rating
Front panel	Battery backup fuse	3.15AF Q/B 250V
Front panel	Mains fuse	1.6A S/B 250V
RS485 Line Protection Module	Line Protection module fuse	1A S/B 250V Anti-surge (T)

Table 9 - Fuse Ratings

5.5.8.1 Battery Fuse

Isolate the battery using the Battery Isolation Switch. Remove the fuse from the battery front panel and replace with one of the same rating.

Re-connect the battery at the Battery Isolation Switch.

5.5.8.2 Mains Fuse

Isolate the mains using the Mains Switch.

Remove and replace the fuse in the mains socket. See Figure 3.

Re-connect the mains at the Mains Switch.

5.5.8.3 Line Protection Module Fuse

Remove the plastic cover from the Line Protection Module. Replace fuses FS1 to FS8 as required.

Replace the cover.

6. USE OF THE STCL ENGINEER'S TERMINAL

6.1 General

Note: The following section applies ***only*** to the use of an STCL Engineer's Terminal.

This section assumes that the user is familiar with Windows® software and terminology.

Plug the terminal in to the socket shown on Figure 3.

Log in in the usual way and select the MIDAS Engineer's Terminal icon from the Main Menu. Figure 7 shows the initial screen displayed on entry to the Engineer's Terminal.

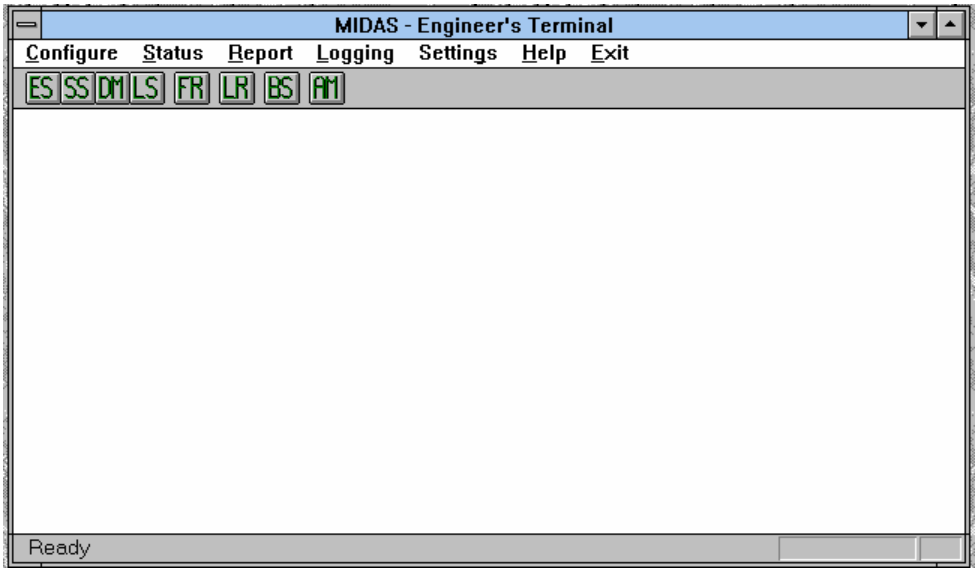


Figure 7 - Initial Screen

Notes:

The menus and buttons displayed on the initial screen above show options that relate to the MIDAS Transponder as well as the Outstation. Not all options are available when the Engineer's Terminal is connected to an Outstation, and any attempt to select them causes a message to be displayed indicating that the selection is not valid. Only the options available from an Outstation are described in this section.

Until the Outstation has been set to normal mode by having data downloaded to it from the instation, only the Baud Speed and About MIDAS options are available

On the MIDAS Main Menu Window, under the menu bar, there are buttons which give easy access to the options listed below (See Figure 7 above):

- ES - Extended Status
- DM - Device Modification
- LS - Loop Status

- FR - Fault Report
- LR - Logging Report
- BS - Baud Speed
- AM - About Midas

These options are described in detail later in this section.

There is a status bar at the bottom of the window. On the left hand side there is a summary of what each menu option can do. On the right hand side there are two small windows; the larger one displays the name of the device the Engineer's Terminal is connected to (i.e. Outstation), and the smaller window shows the address of the device. Until the Engineer's Terminal has been configured as described in Section 6.2 these windows are blank. For example, Figure 7 shows the screen before the Terminal has been configured; Figure 14 shows the screen after configuration.

6.2 Configure

This menu confirms the connection of the Engineer's Terminal to the host, and these options should be selected before using any of the remaining menu options.

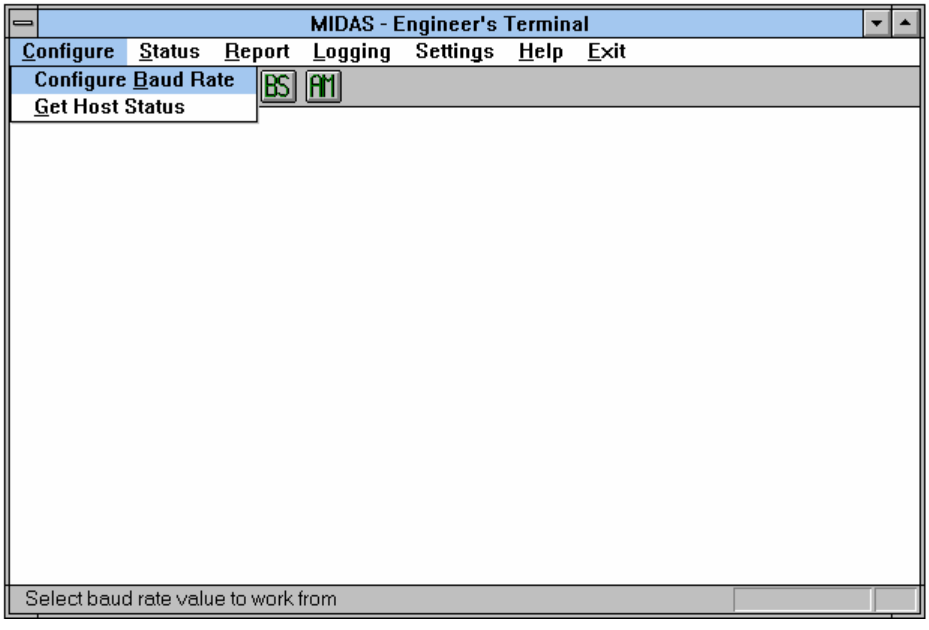


Figure 8 - Configure Menu Options

6.2.1 Configure Baud Rate

Choose from 9600, 4800 or 2400 baud speed for the Engineer's Terminal to communicate with the Outstation. Click on the <OK> button to confirm the entry and close the window. <Cancel> closes the window without making any change to the entry.

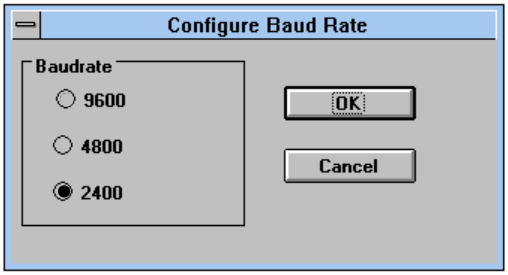


Figure 9 - Configure Baud Rate Dialog Box

6.2.2 Get Host Status

Selecting this option identifies the name and address of the device to which the Engineer's Terminal is connected. The information is then displayed in the status bar at the bottom of the window.

6.3 Status

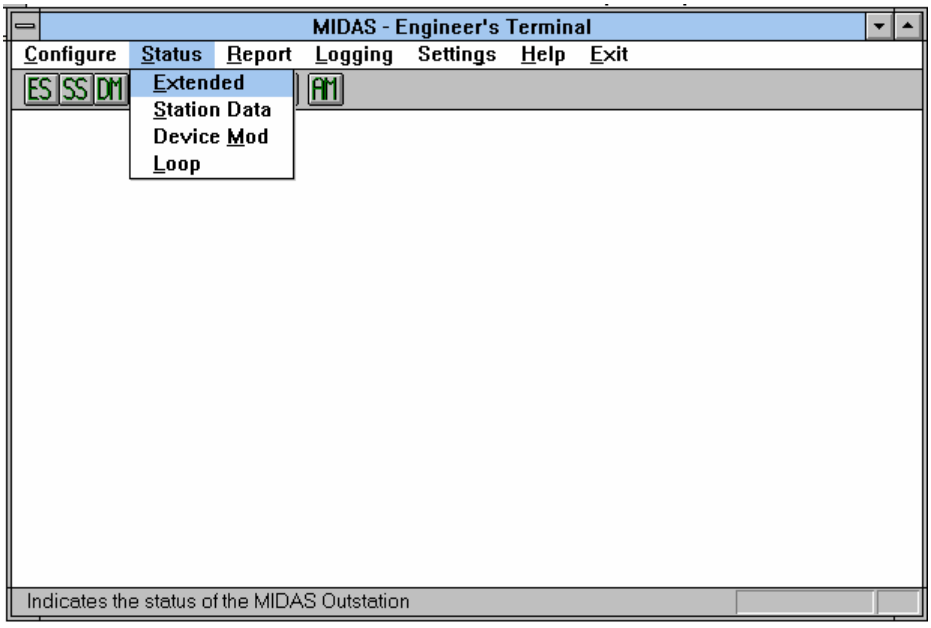


Figure 10 - Status Menu Options

6.3.1 Extended Status

This facility displays a view-only dialog box with the data taken from the Extended Status Reply message. Click on the <OK> button to close the window.

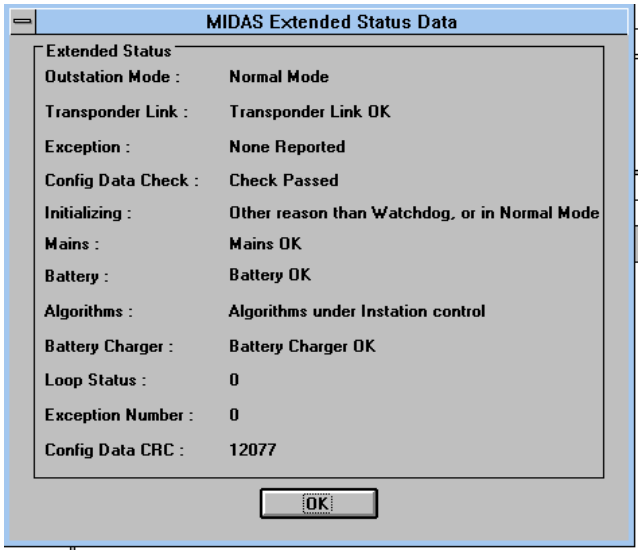
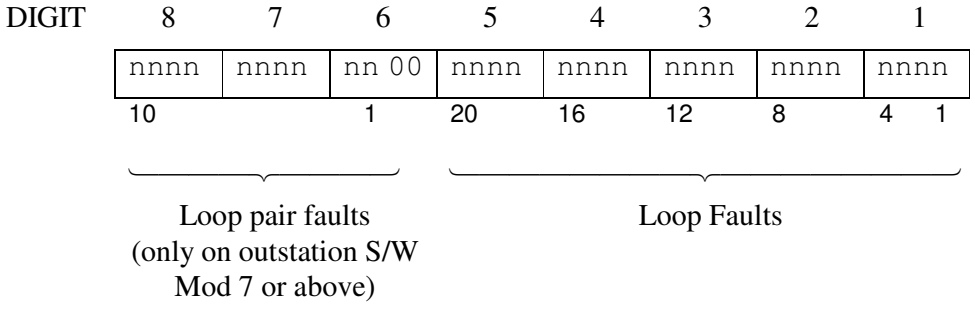


Figure 11 - Extended Status Data Dialog Box

Dialog Box Field	Possible Data	Explanation
Outstation Mode	Initialisation, Normal *or* Reserved mode	Current mode of Outstation
Transponder Link	Re-established *or* OK	Transitory indication – do not use.
Exception	Exception reported *or* None reported	Fault/exception number reported, or not
Config Data Check	Failed/not done, *or* Check Passed	Status of configuration data check
Initialising	Watchdog reset, *or* Other reason than Watchdog, or in Normal Mode	Reason for initialisation
Mains	Failed *or* OK	Mains Status
Battery	Low *or* OK	Battery Status
Algorithms	Disabled by Outstation *or* Under Instation control	Status of algorithms
Battery Charger	Fault *or* OK	Battery Charger Status
Loop Status	`0 – FFCFFFFF` (see **Note 1**)	Faulty loop / Faulty loop pair
Exception Number	Matching exception code to loop	Fault/exception number. Reason for restart.
Config Data CRC	`0 – FFFF`	CRC

Table 10 - Extended Status Data Details

Note 1: For Engineering Terminal software issues greater than 4, the 8 digit HEX value has bits set to indicate loop faults as follows:


DIGIT 8 7 6 5 4 3 2 1
nnnn nnnn nn 00 nnnn nnnn nnnn nnnn nnnn
10 1 20 16 12 8 4 1
Loop pair faults
(only on outstation S/W
Mod 7 or above)
Loop Faults

`n = 1` indicates fault present
`n = 0` indicates no fault.

For example, `0080000C` indicates loop pair faults on loop pair 2, comprising loops 3 and 4.

Note: A loop pair fault is always mirrored by a pair of loop faults. A loop fault does not imply a loop pair fault. Loop pairs are allocated in site and lane order.

A loop pair is indicated faulty when there have been more than a configured number of vehicles detected (typically 10) on one of the loops in the lane, without any detections on the other loop. If the detector has a 'hard' fault, (e.g. open circuit loop), then the loop pair check is inhibited.

6.3.2 Device Modification

This facility displays a view-only dialog box with the data obtained from the Device Modification Reply message. Click on the <OK> button to close the window.

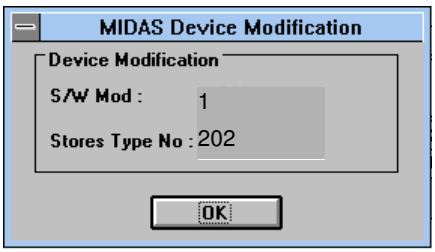


Figure 12 - Device Modification Dialog Box

Dialog Box Field	Possible Data	Explanation
S/W Mod	Number	Modification Number
Stores Type No	Number	Store Type Code

Table 11 - Device Modification Details

6.3.3 Loop Status

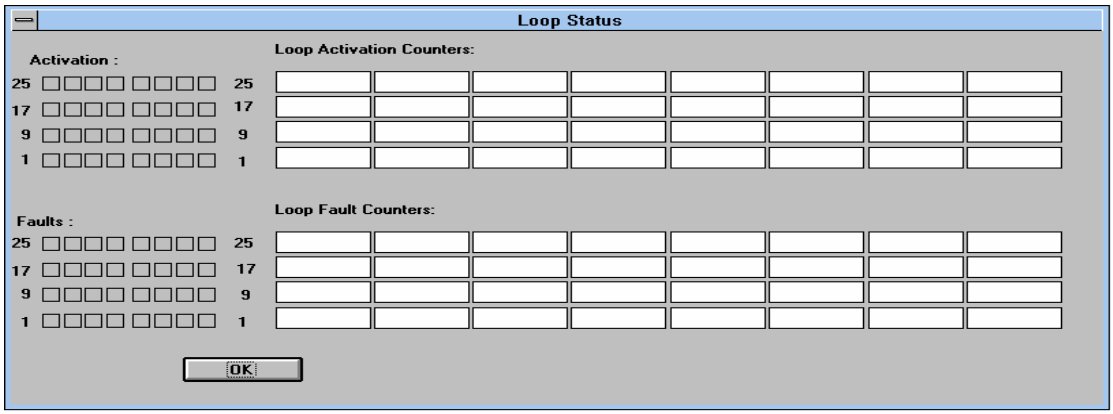


Figure 13 - Loop Status Dialog Box

This facility displays a view-only dialog box with the data obtained from the Loop Status message. The top half of the screen displays loop activation data; when a loop is activated a cross appears in the relevant Activation box.

The lower half of the screen displays fault data; when a loop fault is detected a cross appears in the relevant Faults box.

If the Outstation is configured to perform loop pair fault monitoring, then the detection of the loop pair fault condition causes both of the loops in a lane to be indicated as faulty on this screen.

Click on the <OK> button to close the window.

6.4 Report

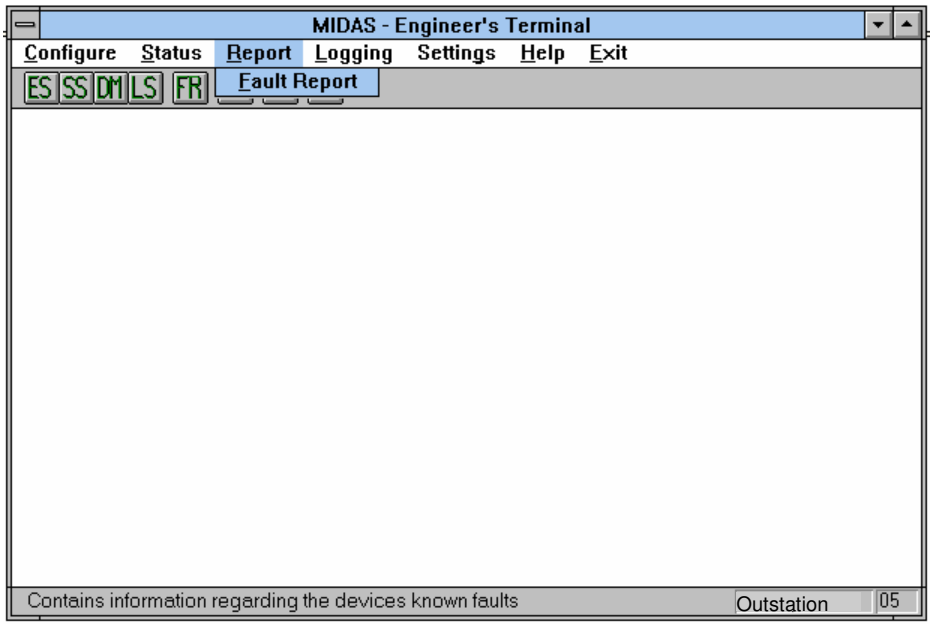


Figure 14 - Report Menu Option

6.4.1 Fault Report

This facility displays a view-only dialog box with the data obtained from the Fault Report message. Click on the <OK> button to close the window. Click on the <Save> button to save the contents of the window to a text file. You are prompted to enter a name and destination for the text file.

Access the text file and print the fault report (if required) in the usual way.

The faults and fault clearances are retained in the log in battery supported store. When the log has filled up completely, new fault entries overwrite the oldest ones. The outstation has no record of date, so the log only contains times of day.

Note: Software Mod 7 (see Device Modification command, section 6.3.2) does not put an entry in the fault log for loops which were already faulty prior to entering normal mode. Use the loop status command to check the current fault status of loops.

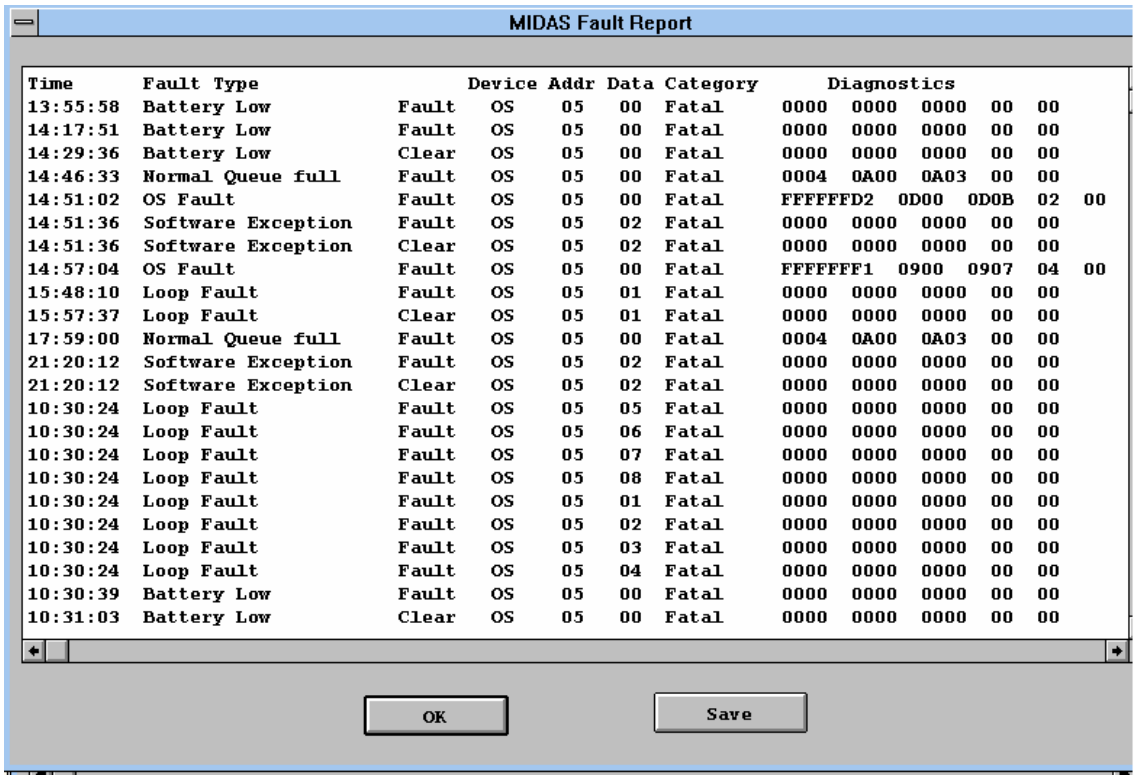

MIDAS Fault Report
Time Fault Type Device Addr Data Category Diagnostics
13:55:58 Battery Low Fault OS 05 00 Fatal 0000 0000 0000 00 00
14:17:51 Battery Low Fault OS 05 00 Fatal 0000 0000 0000 00 00
14:29:36 Battery Low Clear OS 05 00 Fatal 0000 0000 0000 00 00
14:46:33 Normal Queue full Fault OS 05 00 Fatal 0004 0A00 0A03 00 00
14:51:02 OS Fault Fault OS 05 00 Fatal FFFFFFD2 0D00 0D0B 02 00
14:51:36 Software Exception Fault OS 05 02 Fatal 0000 0000 0000 00 00
14:51:36 Software Exception Clear OS 05 02 Fatal 0000 0000 0000 00 00
14:57:04 OS Fault Fault OS 05 00 Fatal FFFFFFF1 0900 0907 04 00
15:48:10 Loop Fault Fault OS 05 01 Fatal 0000 0000 0000 00 00
15:57:37 Loop Fault Clear OS 05 01 Fatal 0000 0000 0000 00 00
17:59:00 Normal Queue full Fault OS 05 00 Fatal 0004 0A00 0A03 00 00
21:20:12 Software Exception Fault OS 05 02 Fatal 0000 0000 0000 00 00
21:20:12 Software Exception Clear OS 05 02 Fatal 0000 0000 0000 00 00
10:30:24 Loop Fault Fault OS 05 05 Fatal 0000 0000 0000 00 00
10:30:24 Loop Fault Fault OS 05 06 Fatal 0000 0000 0000 00 00
10:30:24 Loop Fault Fault OS 05 07 Fatal 0000 0000 0000 00 00
10:30:24 Loop Fault Fault OS 05 08 Fatal 0000 0000 0000 00 00
10:30:24 Loop Fault Fault OS 05 01 Fatal 0000 0000 0000 00 00
10:30:24 Loop Fault Fault OS 05 02 Fatal 0000 0000 0000 00 00
10:30:24 Loop Fault Fault OS 05 03 Fatal 0000 0000 0000 00 00
10:30:24 Loop Fault Fault OS 05 04 Fatal 0000 0000 0000 00 00
10:30:39 Battery Low Fault OS 05 00 Fatal 0000 0000 0000 00 00
10:31:03 Battery Low Clear OS 05 00 Fatal 0000 0000 0000 00 00
OK
Save

Figure 15 - Fault Report Dialog Box

Dialog Box Field	Possible Data	Explanation
Time	0-23 for hours, 0-59 for minutes, 0-59 for seconds	Time the fault or clearance of fault occurred
Fault Type	Text	Name of the fault. See Section 5.3 for diagnosis and remedy for each fault
Fault Status	Clear *or* Fault	Fault cleared or fault reported
Device	Outstation (O/S)	The device reporting the fault
Addr	Number	Address of the device
Data	Number	Dependent on fault type – for engineering use only
Category	Fatal, Error *or* Warning	Category of fault
Diagnostics	Number	Dependent on fault type - for engineering use only

Table 12 - Fault Report Details

6.5 Logging

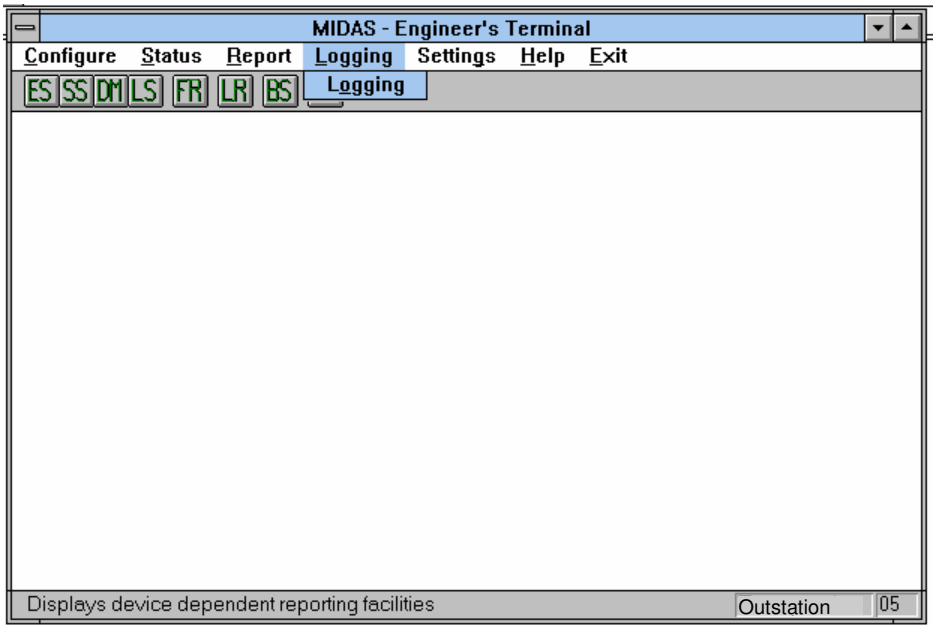


Figure 16 - Logging Menu Option

6.5.1 Logging

This facility first displays a dialog box as shown in Figure 17. The data to be displayed can be enabled or disabled, by clicking on the required check box(es). When a change is made in the window and the <OK> button is pressed a dialog box appears, “Are you sure you want to Enable/Disable these functions?”

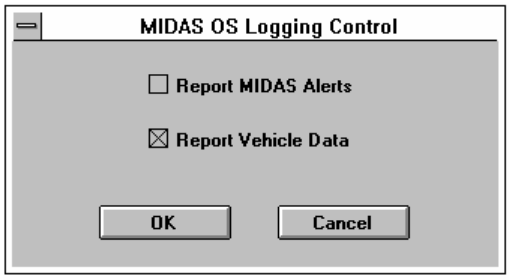


Figure 17 - Logging Control Dialog Box

The <Cancel> button closes the dialog box without saving any changes and re-displays the main screen (See Figure 7). The <OK> button closes the window and then a further window prompts for a file name and destination for the logging data. Make entries where appropriate on the screen and press <OK>. The <Cancel> button allows the data to be displayed without saving it to disk.

The Logging dialog box (Figure 18) then appears, where messages are displayed as they are sent and received. This information may not be changed.

The <Pause> button in the Logging box stops the scrolling of messages in the window.

The <OK> button in the Logging box closes the dialog box.

The <Resume> button in the Logging box starts the scrolling of messages in the window again.

In the dialog box shown below, the first message is a MIDAS Alert and all the others are vehicle data messages.

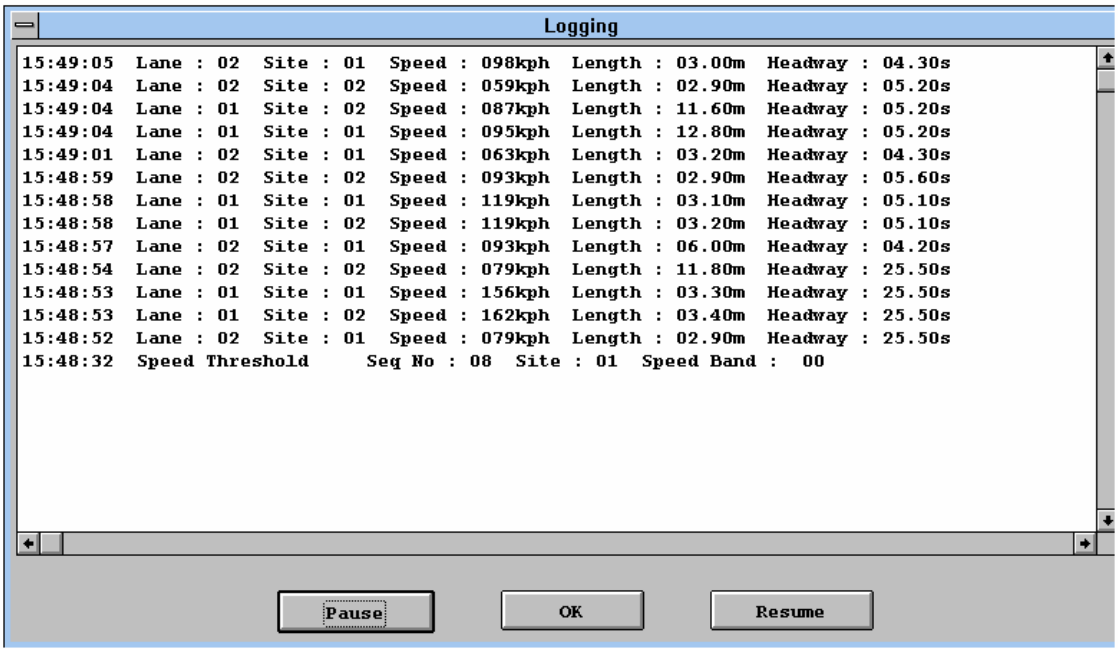

Logging
15:49:05 Lane : 02 Site : 01 Speed : 098kph Length : 03.00m Headway : 04.30s
15:49:04 Lane : 02 Site : 02 Speed : 059kph Length : 02.90m Headway : 05.20s
15:49:04 Lane : 01 Site : 02 Speed : 087kph Length : 11.60m Headway : 05.20s
15:49:04 Lane : 01 Site : 01 Speed : 095kph Length : 12.80m Headway : 05.20s
15:49:01 Lane : 02 Site : 01 Speed : 063kph Length : 03.20m Headway : 04.30s
15:48:59 Lane : 02 Site : 02 Speed : 093kph Length : 02.90m Headway : 05.60s
15:48:58 Lane : 01 Site : 01 Speed : 119kph Length : 03.10m Headway : 05.10s
15:48:58 Lane : 01 Site : 02 Speed : 119kph Length : 03.20m Headway : 05.10s
15:48:57 Lane : 02 Site : 01 Speed : 093kph Length : 06.00m Headway : 04.20s
15:48:54 Lane : 02 Site : 02 Speed : 079kph Length : 11.80m Headway : 25.50s
15:48:53 Lane : 01 Site : 01 Speed : 156kph Length : 03.30m Headway : 25.50s
15:48:53 Lane : 01 Site : 02 Speed : 162kph Length : 03.40m Headway : 25.50s
15:48:52 Lane : 02 Site : 01 Speed : 079kph Length : 02.90m Headway : 25.50s
15:48:32 Speed Threshold Seq No : 08 Site : 01 Speed Band : 00
Pause
OK
Resume

Figure 18 - Logging Report Dialog Box

Alert messages are presented in the following form:

Dialog Box Field	Possible Data	Explanation
Time	0-23 for hours, 0-59 for minutes, 0-59 for seconds	Time of the occurrence
Message Data	Text	Dependent on Type of Message
Sequence Number	Number	MIDAS Alert sequence number
Site Number	Number	Dependent on Type of Message
Alert Data	0 - 255	Lane in Alert

Table 13 - Alert Logging Report Details

Vehicle Data messages are presented in the following form:

Dialog Box Field	Possible Data	Explanation
Time	0-23 for hours, 0-59 for minutes, 0-59 for seconds	Time of the occurrence
Lane Number	Number	The number of the lane within the site monitored by the loop
Site Number	Number	The number of the site containing the loop
Speed	Number	Vehicle speed in Km per hour
Length	Number	Vehicle length in 0.1m increments
Headway	Number	Vehicle headway in 0.1m increments

Table 14 - Vehicle Data Logging Report Details

6.6 Settings

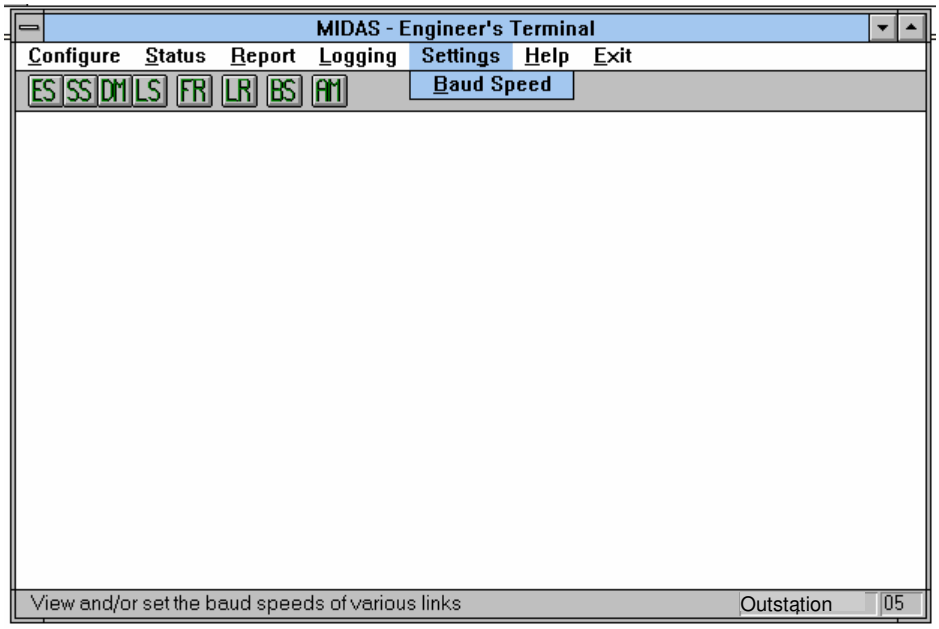
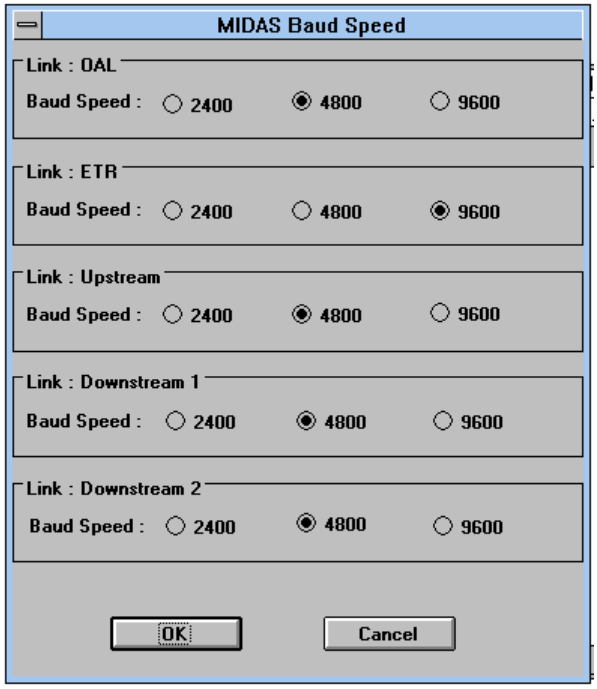


Figure 19 - Settings Menu Option

6.6.1 Baud Speed

This facility displays a dialog box with the data obtained from the Baud Rate Reply message. The data can be changed, by clicking on the required radio buttons. Click on the <OK> button to close the window, recording any changes made to the baud rates of individual links. Click on the <Cancel> button to close the window, without saving any changes.


MIDAS Baud Speed
Link : OAL
Baud Speed : 2400 4800 9600
Link : ETR
Baud Speed : 2400 4800 9600
Link : Upstream
Baud Speed : 2400 4800 9600
Link : Downstream 1
Baud Speed : 2400 4800 9600
Link : Downstream 2
Baud Speed : 2400 4800 9600
OK
Cancel

- Outstation Auxiliary Link

- Engineering Terminal Link

- Transponder Link

- not used (transponder only)

- not used (transponder only)

Figure 20 - Baud Speed Dialog Box

6.7 Help

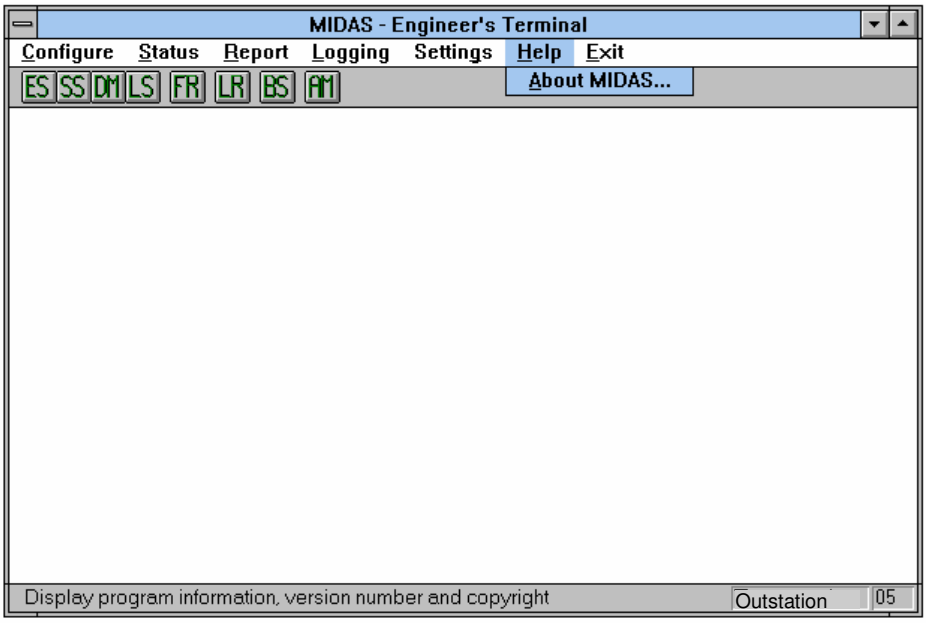

MIDAS - Engineer's Terminal
Configure Status Report Logging Settings Help Exit
About MIDAS...
ES SS DM LS FR LR BS AM
Display program information, version number and copyright
Outstation
05

Figure 21 - Help Menu Option

6.7.1 About MIDAS...

This facility displays a view-only dialog box with the data obtained from the "About" message. Click on the <OK> button to close the window.

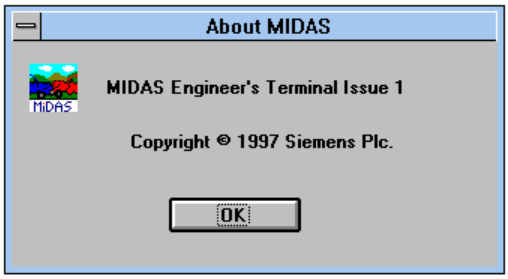


Figure 22 - About MIDAS Dialog Box

6.8 Exit

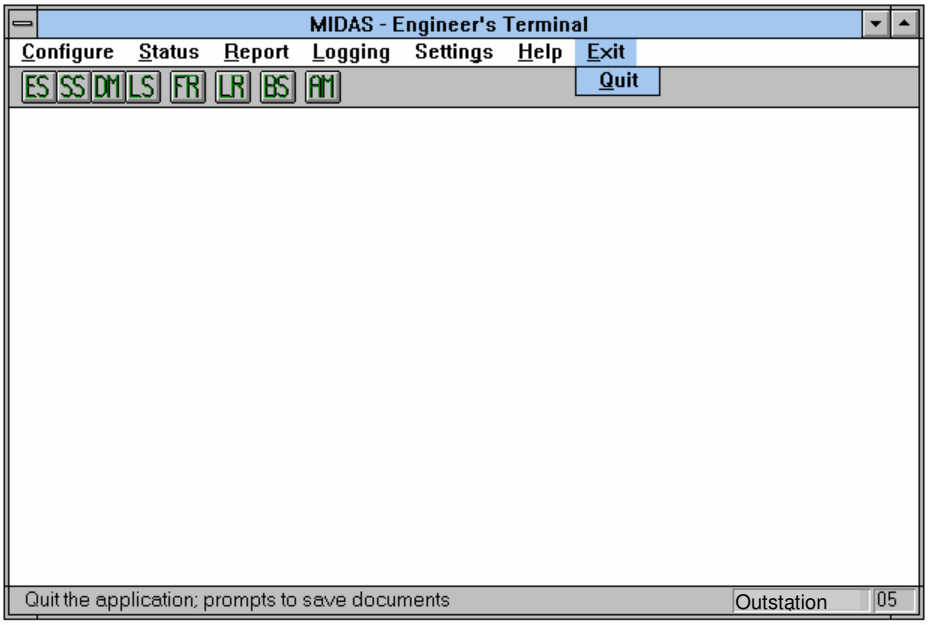


Figure 23 - Exit Menu Option

6.8.1 Quit

This facility exits the application.

7. TECHNICAL SPECIFICATION

7.1 Physical Characteristics

		Unpackaged - unit only	Packaged with installation kit
Size	**height**	130 mm	225 mm
	width	480 mm	580 mm
	depth	240 mm	465 mm
Approx. Weight	**without battery**	3.0 Kg	7.2 Kg
	with battery	5.8 Kg	10.0 Kg

7.2 Power Requirements

	Mains Input
Voltage	85 - 260V AC
Frequency	47 - 440Hz
Rated current	150mA

7.3 Features

'CE' Certified.

A MIDAS Outstation can sample up to 20 loops.

It reports averages for speed, occupancy, headway and flow over a configurable interval.

It provides alarms when there is a configurable change in average speed or flow at a site.

It provides alarms when there is a high occupancy condition in a lane.

7.4 Safety

Meets Electrical Safety requirement BS EN 60950.

Meets Telecommunications Safety requirement EN 41003.

7.5 EMC

MIDAS Outstations meet emission and susceptibility requirements of TRG 1068, with the exception of the Detector Loop operating frequency, which complies with MPT 1337.

7.6 Environmental Information

The roadside equipment meets the mechanical and temperature requirements of UK Department of Transport (Highways Agency) Specification TR2130B (May 1993).

Operating temperature from -15°C to 65°C.

Humidity +95% (non-condensing).

7.7 Data Rates

Standard rates 2400, 4800, 9600.

Other rates programmable up to 38,400.

7.8 Battery Backup

Lead acid battery support - 20 hour operation.

SRAM memory support - 1 year.

7.9 Lightning Protection

Meets the requirements of CCITT K20.

7.10 Processor

32 bit Embedded Power PC.

Up to 512KByte PROM, 1Mbyte SRAM (Battery backed).

1Mbyte Flash.

4 Synchronous/Asynchronous Isolated RS485 ports.

2 Synchronous/Asynchronous RS232 ports.

1 Asynchronous RS232 port.

JTAG Interface.

Real Time Clock.

7.11 Engineer's Terminal

The hardware needed to run the MIDAS Engineer's Terminal software is a standard (IBM compatible) portable PC with a suitable lead to connect to the 9 pin 'D' type socket located on the front of the Power PC Processor PCB.

The PC must have the following features as minimum requirements:

- Processor of the 80386 family
- 4 Mb of RAM
- Hard disk drive with minimum capacity 40Mb ("C" drive)
- 1 x integral floppy disk drive (3.5", 1.44Mb) or access to one
- 1 x RS232C 9 way serial port; required cable connections as defined by STCL. (The part number is given in Appendix C .)
- 1 x standard 25 pin parallel printer port
- Operating system MS-DOS® (version 3.3 minimum)
- Microsoft® Windows® version 3.1 or greater
- Standard size display screen (80 column x 25 lines) CGA compatible, colour or monochrome
- Power supply from mains (with adapter) and batteries (rechargeable)
- Full QWERTY keyboard

In addition, a mouse or trackerball would be a desirable option.

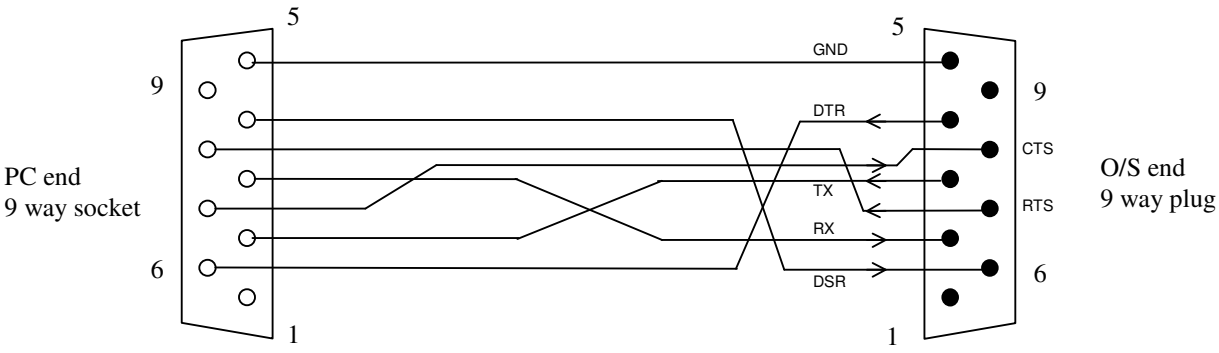


Figure 24 - Wiring Diagram for Engineer's Terminal to Outstation cable

The part number of the software for the Engineer's Terminal is 667/1/26752/000.

7.12 Loop Detectors

Number of loops - 20.

Meets the requirements of TR0100A.

The MIDAS Loop Detector is a scanning 4-channel detector with a single Eurocard outline. It meets the requirements of Radio Regulation MPT 1337.

The front panel has the following features:

- Three sensitivity switches per channel.
- One presence time switch per channel.
- Reset button.
- Lamp button.
- Fault and Detect LEDs.

Power supply and current	either A: 5V DC at 60mA current
	12V DC at 20mA current
	or B: 24V DC at 80mA current
Environmental	0°C to 65°C up to 95% humidity
Size	160mm x 100mm x 25mm
Inductance Tuning Range	50µH to 300µH (plus feeder inductance)
Feeder Length	0 - 200 metres
Operating Frequency	20kHz to 110kHz
Vehicle Speed Range	0 to 195 km/h using loops 2m in direction of travel

APPENDIX A - TECHNICAL DRAWINGS

This Appendix contains the following drawings:

667/GA/26767/000	MIDAS Outstation
667/GA/26775/ETC	Detector Loop Cable Assembly
667/GA/26771/ETC	Comms I/O PCB Kit
667/DA/26771/ETC	Comms I/O Circuit Diagram
667/GA/26601/ETC	Power Processor PCB Assembly
667/DA/26601/ETC	Power Processor Circuit Diagram
667/GA/20982/ETC	RS485 Line Protection PCB Assembly
667/DA/20982/ETC	RS485 Line Protection Circuit Diagram
667/GA/26761/000	Backplane PCB Assembly
667/DA/26761/000	Backplane Circuit Diagram
667/GA/26759/ETC	Outstation Detector PCB
667/DA/26759/ETC	Outstation Detector Circuit Diagram

The following pages in this Appendix are not included in the page numbering of this document.

APPENDIX B - PARTS LISTS

This Appendix contains parts lists and drawing information for the Siemens MIDAS Outstation. A hierarchical breakdown of the main components is given in the form of a tree structure. References to technical drawings are given as part of the tree structure. Those technical drawings needed for the maintenance of the equipment are given in Appendix A.

This Appendix is split into two sections.

The first section provides a family tree for the equipment. The trees show:

- the component number for the parts list of each product,
- the part numbers of technical drawings which are relevant to the product

The second section contains a number of parts lists. These are divided into sections for each major component.

The following pages in this Appendix are not included in the page numbering of this document.

APPENDIX C - PART NUMBERS

Equipment Description	Part No
Address Header	667/1/26774/000
Battery Backup fuse	518/4/90285/007
Comms I/O PCB Kit	667/1/26747/000
Line Protection Module fuse	518/4/90284/005
Loop Detector PCB	667/1/26758/000
Mains fuse	518/4/90284/004
Outstation Power PC Processor PCB	667/1/26601/000
Outstation PROM	667/1/12751/000
Power PC Processor PCB Battery	418/4/39820/000
Power Supply Battery	418/4/42314/023
Power Supply Unit	605/4/97048/000
RS485 Line Protection Module PCB	667/1/20982/000
Engineer's Terminal Software	667/1/26752/000

APPENDIX D - INITIALISATION SIMULATOR SCRIPT

The following text file, stored as OSINI.SCR will initialise the Outstation. Run from the DOS prompt with:

MIDEQUIP OSINI.SCR

where MIDEQUIP.EXE and OSINI.SRC are in the current directory.

Note that lines starting with $REM are comment lines only.

```
$REM ============================================================================
$REM ======================   FILE HEADER  ======================================
$REM ============================================================================
$REM SCRIPT NAME                      OSINI.SCR
$REM EQUIP SIMULATING                 TPR
$REM SIMULATOR VERSION                MIDEQUIP V3.3 OR LATER
$REM
$REM This script initialises the Outstation to use all 20 detector loops.
$REM The Outstation firmware MUST be Software Mod 7 or greater (since the
$REM device data includes loop pair fault thresholds).
$REM
$REM ISSUE  DATE        MOD BY        CHANGE
$REM
$REM
$REM ============================================================================
$REM ======================    SCRIPT HEADER ====================================
$REM ============================================================================
$DEVICE TPR-OS
$ADDRESS,05,$EOA
$BAUD 4800
$LOGFILE OSINI.LOG
$REM define which alerts to be auto ack
$ALRTR,1,2,3,$EOL
$REM ============================================================================
$REM ======================    SCRIPT MAIN BODY ==================================
$REM ============================================================================
$REM Step 0 - Set up initial conditions
$REM Step 0 - Wait for EXTENDED STATUS REPLY
$SOM,STEP0,OS05,TPR,21,$EOH,**,**,**,**,**,**,**,**,**,**,$EOM
$REM Step 1 - Send DEVICE DATA
$SOM,STEP1,TPR,OS05,13,$EOH,00,38,00,40,00,08,00,40,00,00,00,00,00,00,00,00,
04,18,FA,07,3C,F0,14,0A,
```

```
93,13,A3,23,95,15,A5,25,97,17,A7,27,B7,37,99,19,
A9,29,B9,39,00,00,00,00,00,00,00,00,00,00,00,00,
64,64,02,64,64,02,64,64,03,64,64,03,
7D,0A,50,10,01,50,02,28,02,50,02,28,
7D,0A,50,10,01,50,02,28,02,50,02,28,
7D,0A,50,10,01,50,02,28,02,50,02,28,03,50,02,28,
7D,0A,50,10,01,50,02,28,02,50,02,28,03,50,02,28,
01,FA,09,0F,14,18,1E,23,27,08,0B,10,15,19,1F,24,
01,FA,09,0F,14,18,1E,23,27,08,0B,10,15,19,1F,24,
01,FA,09,0F,14,18,1E,23,27,08,0B,10,15,19,1F,24,
01,FA,09,0F,14,18,1E,23,27,08,0B,10,15,19,1F,24,
0F,01,00,32,46,6E,01,01,
01,FA,1E,32,43,50,64,74,80,1A,25,35,46,55,69,7D,
01,FA,1E,32,43,50,64,74,80,1A,25,35,46,55,69,7D,
01,FA,1E,32,43,50,64,74,80,1A,25,35,46,55,69,7D,
01,FA,1E,32,43,50,64,74,80,1A,25,35,46,55,69,7D,
23,08,$EOM
$REM Step 2 - Send UPDATE TIME message
$SOM,STEP2,TPR,OS05,01,$EOH,HH,MM,SS,$EOM
$REM Step 3 - Wait for EXTENDED STATUS REPLY (normal mode)
$SOM,STEP3,OS05,TPR,21,$EOH,**,02,**,**,**,**,**,**,**,**,$EOM
$REM
$REM Step 4 - Send OUTSTATION CONTROL message (enable everything for
$REM all sites)
$SOM,STEP4,TPR,OS05,12,$EOH,0F,0F,0F,0F,$EOM
$REM Step 5 - Wait for EXTENDED STATUS REPLY
$SOM,STEP5,OS05,TPR,21,$EOH,00,02,**,**,**,**,**,**,**,**,$EOM
$REM
$REM Test now runs until terminated by user
$COMMENT Test now runs until terminated by user
$WAIT USER
$REM
$SCRIPTEND
```

INDEX

—A—

About MIDAS... 45
Address 34
  Link Values 20
Address Header 10. *See also* Board Address Header
  Fit 20
  Program 20
Alarm 47
Alerts 10
AM 34
Auxiliary link 10

—B—

BAT1 30
Battery 9, 10, 14, 22
  Charge 14
  Charger 15
  Charger fault 27
  Fuse 32
  Isolation Switch 22
  Low fault 26
  Replacement 25, 30, 31
Battery Backup
  Features 48
Baud rate 22
Baud Speed 44
Board Address Header 15
British Standards 7
BS 34

—C—

Cables 15
Circuit Diagrams 50
Comms I/O PCB 10, 15, 20
  Defaults 29
  Replacement 30
Configure
  Baud 35

—D—

Data Rates 48
Default settings 29
Device Modification 38
DIAG 15, 26
DM 33

—E—

Earth 17, 31
  Cable 15
  Earthing 19
Electrical Safety 47
Engineer's Terminal 10, 15, 33, 48
Environmental Requirements 47
ES 33
Exit 46
Extended Status Data 22, 36

—F—

Fault finding 37, 38
Fault Report 39
Faults 26
Features 47
Flying Earth Lead *See also* Earth
FR 34
Frequency 47
Functionality 10

—H—

Health and Safety 6, 9
Help 45
Host status 35

—I—

IEC320 15
Individual Vehicle Data 10
Installation 17

—K—

Klippon block 15, 17

—L—

LEDs 15, 22
Line Protection Module 14, 25. *See also* RS485
Link Data Rates 29
Local 18
Logging Control 41
Loop
  Cable 15
  Pair Fault Monitoring 37
  Status 38
Loop Detector
  Fault 27
  Features 49
  Leads 19
  Operating frequency 49
  PCB 10
  PCB Defaults 29
  PCB interface 15
  Specification 49
LR 34
LS 33

—M—

Mains 21
  Cable 15
  Fault 27
  Fuse 32
Maintenance
  Routine 25
MIDAS Alerts 10
Monitor circuits 15
Mounting frame 14

—O—

Overview 10

—P—

Part Numbers 52
Parts lists 51
PC 48
PCB
  Switches 28
Power PC Processor PCB 10, 15
  Defaults 29
  Replacement 30
Power Supply 14
  Battery Backup 25
  Battery Replacement 31
  Loop Detector 49
  Replacement 30, 31
  Unit 10
PRC ERR 15, 26
Processor
  Features 48
Processor error 15
PSU ..... *See* Power Supply

—Q—

Quit 46

—R—

RAM Battery Backup 25
Rated current 47
Remote 18
Replaceable parts 25
Reset 15, 26, 27, 28
RS485 ..... 10, 14
  Cable 15
  Communications channels 15
  Flying Earth Lead 19
  Line Protection Module 14, 17
    Fuse 32
    PCB 10, 16
    Replacement 32
  Polarity 18
RUN 15, 26

—S—

Safety 47
Safety Instructions 9, 25
Sealed Lead Acid Batteries 9
Size 47
Software
  running 15
  status 15
Specification
  Engineer's Terminal 48
Status bar 35
System Overview 10

—T—

Telecommunications Safety 47
TPR - O/S LINK 18
Traffic Data 10
Transponder
  Link 22

—V—

Vehicle Data 10
Voltage 14, 47

—W—

W/D FAIL 15, 26
Watchdog 15
Weight 47
Wiring 19

Last page of the Midas Outstation System Handbook